THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXV. No. 626.] LONDON, MAY 11, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL
COAL. Analysis—10,000 cubic feet of gas per ton of coal: 26-candle gas: 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES. CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

PROUD'S
SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
BROOKFIELD WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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JOHN RUSSELL AND CO.,
THE OLD TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
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COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE,
} LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fitting for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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BELL BARN ROAD, BIRMINGHAM,
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WET AND DRY GAS-METERS,
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Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
ESTABLISHED 1830.

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TELESCOPIC & SINGLE GASHOLDERS,
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and Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
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Roofs, Girders, and Bridges, and General Smith's Work.
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FOR THE
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RETORT-SETTING A SPECIALITÉ.
RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
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PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
For the English Government, and for the Government of the Netherlands;
MAKERS OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
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236, GEORGE STREET, GLASGOW: AND 15, MARKET STREET, MANCHESTER.

G. G. and Co. have just received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

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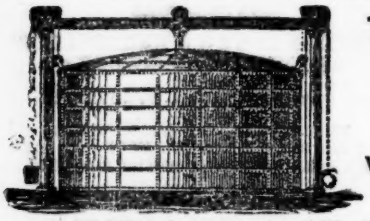
LIVERPOOL: No. 63, Paradise Street.
MANCHESTER: Barlow's Croft, Chapel Street, Salford.
PARIS: No. 38, Rue du Chateau d'Eau.
LILLE: No. 38, Rue Grande Chaussee.

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS



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WHITESTONE IRON-WORKS, HUDDERSFIELD

MANUFACTURERS OF

RETORTS, ANNULAR AND PIPE CONDENSERS,
WROUGHT AND CAST IRON SCRUBBERS, PURIFIERS,
GASHOLDERS,

GOVERNORS, AND ALL THE NECESSARY FITTINGS FOR COMPLETING THE ERECTION OF GAS-WORKS.

STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

Sole Makers of B. W. Thurston's Combined Condensing, Scrubbing, and Washing Apparatus,

AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

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(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL,
SAMUEL H. JOHNSON, } Joint Managing Directors.

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Late JOHN VICKARY,

ESTABLISHED 1840.

GAS ENGINEERS, CONTRACTORS, IRON AND BRASS FOUNDERS,

WEST OF ENGLAND ENGINEERING WORKS, EXETER.

GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Rack and Screw Valves. Gas and Water Mains always in Stock.

STEAM-ENGINES, EXHAUSTERS, SHAFTING AND GEARING, &c.

GAS-FITTINGS,

Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs.

WET & DRY GAS-METERS,

Combining most recent improvements in principle and manufacture; upwards of 200,000 already in work, giving highest satisfaction.
(A guarantee of five years given with every Meter.)

PLUMBERS WORK, including Lift and Force Pumps; Cocks for Gas and Water and Steam; Brass Fittings.

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FOR GAS, STEAM, AND WATER;

GAS-FITTERS TOOLS, STEAM COCKS, AND ALL KINDS OF JOINTS.

HYDRAULIC TUBES, CORE BARS, TELEGRAPH POSTS, COILS, &c.

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MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

FLETCHER AND MURPHY,

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Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

CLASS II.

This Paint having been in general use over thirteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

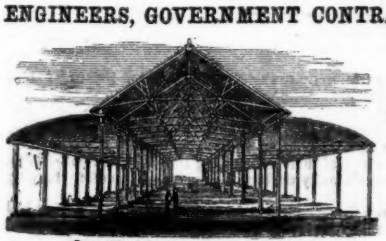
N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

FRANCIS MORTON & CO., LIMITED, LIVERPOOL.

ESTABLISHED OVER A QUARTER OF A CENTURY.

ENGINEERS, GOVERNMENT CONTRACTORS, & MANUFACTURERS OF GALVANIZED CORRUGATED IRON ROOFS,



Open Shed for Covering Large Areas.

BUILDINGS, AND SHEDDING,

For which Estimates will be given on application,

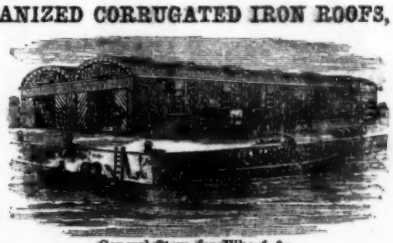
ERECTED COMPLETE IN THIS COUNTRY

OR

PREPARED TO PLAN FOR ERECTION ABROAD,

EITHER WITH

TIMBER FRAMING or WHOLLY in IRON.



General Store for Wharf, &c.

GALVANIZED or PAINTED CORRUGATED IRON ROOFING PLATES and TILES. HEAVY CORRUGATED IRON PLATES for FIREPROOF FLOORS, ROADWAYS, PARAPETS, &c. WROUGHT-IRON TANKS, GUTTERING, and CONSTRUCTIONAL WROUGHT IRONWORK.

Designs prepared, and Illustrated Descriptive Catalogue forwarded on application.

LONDON OFFICE: 1, DELAHAY STREET (First door out of Great George Street), WESTMINSTER, S.W.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

J. T. B. PORTER AND CO.,

ENGINEERS AND CONTRACTORS,

LINCOLN, AND 1, WESTMINSTER CHAMBERS, LONDON, S.W.,

Beg respectfully to remind Gas Companies and Corporations that they continue to manufacture and supply every description of Apparatus connected with the

MANUFACTURE OF GAS AND ITS DISTRIBUTION.

GASHOLDERS, PURIFIERS, SCRUBBERS, CONDENSERS, RETORTS, &c., &c.

PLANS, SPECIFICATIONS, AND ESTIMATES FOR WORKS OF ANY SIZE.

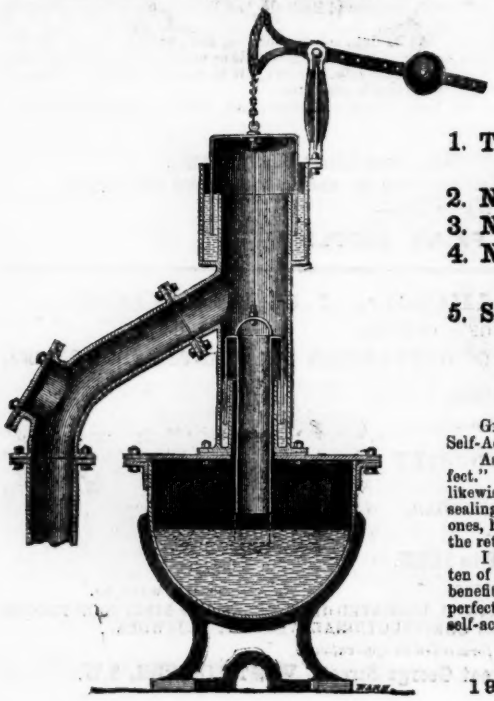
REFERENCES TO MORE THAN 500 WORKS ALREADY ERECTED.

PROSPECTUSES AND TESTIMONIALS ON APPLICATION.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

19, GREAT GEORGE STREET, WESTMINSTER.

WILLEY AND FORD,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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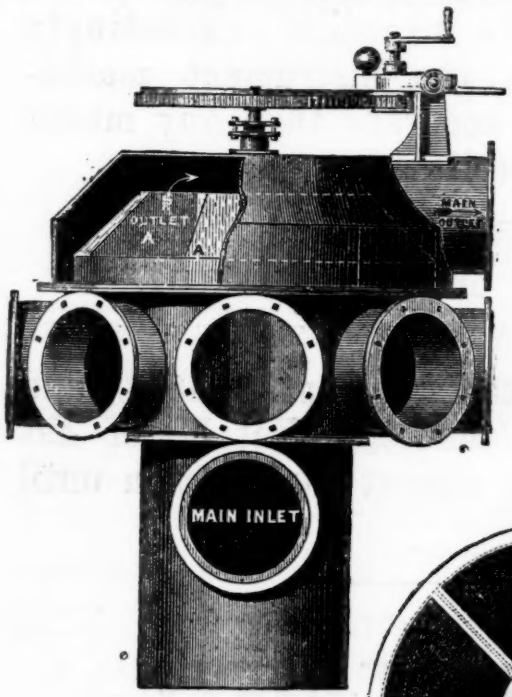
An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

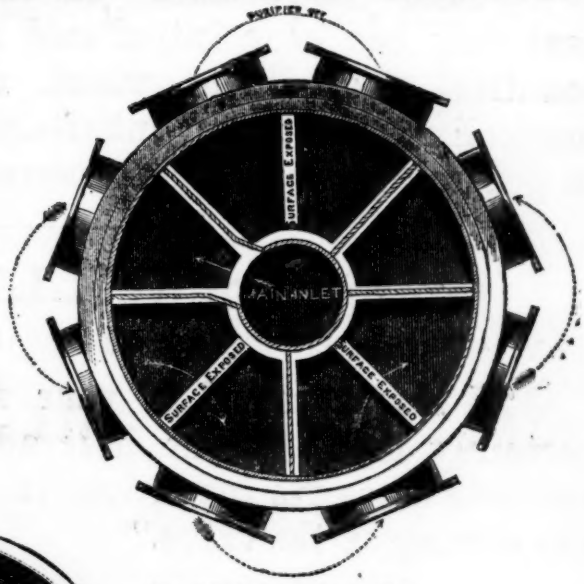
☞ PLEASE NOTE THE ADDRESS–

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

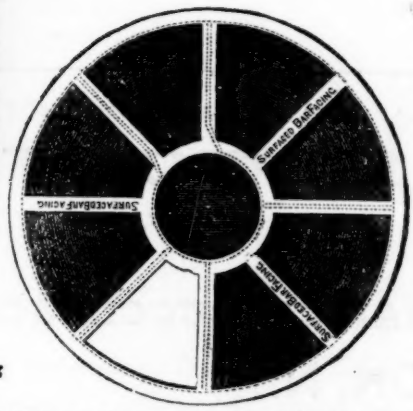
C. & W. WALKERS' PATENT CENTRE-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.



Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.

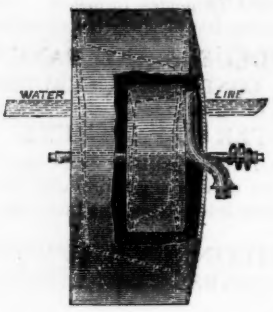
MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

WARNER AND COWAN'S
SELF-REGULATING GAS-METER.

BY LETTERS PATENT

FOR

GREAT BRITAIN,
FRANCE,
BELGIUM,



AUSTRIA,
PRUSSIA,
AND THE
UNITED STATES OF AMERICA.

Opinion of W. RICHARDS, Esq., London,

INVENTOR OF THE DRY GAS-METER.

"Your improvement in the Wet Meter is decidedly the best that has been introduced since its invention; exceedingly beautiful and simple, which renders the instrument mathematically correct, and infinitely more accurate than any means in general usage for the measurement of liquids."

Opinion of WILLIAM MANN, Esq.,

LATE SUPERINTENDENT OF CHARTERED GAS-WORKS, BLACKFRIARS, LONDON.

"I saw a model of your wheel to-day (Sept. 8, 1874), and certainly think it the best addition that the Wet Meter has received since its invention, to ensure correct registration until the closing of the valve."

THE ORIGINAL LICENSEES AND MANUFACTURERS:

W. & B. COWAN,

ESTABLISHED 1827,

KING HENRY'S WALK,

BALL'S POND ROAD,

NEAR DALSTON JUNCTION STATION.

LONDON, N.

BUCCLEUCH ST. WORKS,

EDINBURGH.

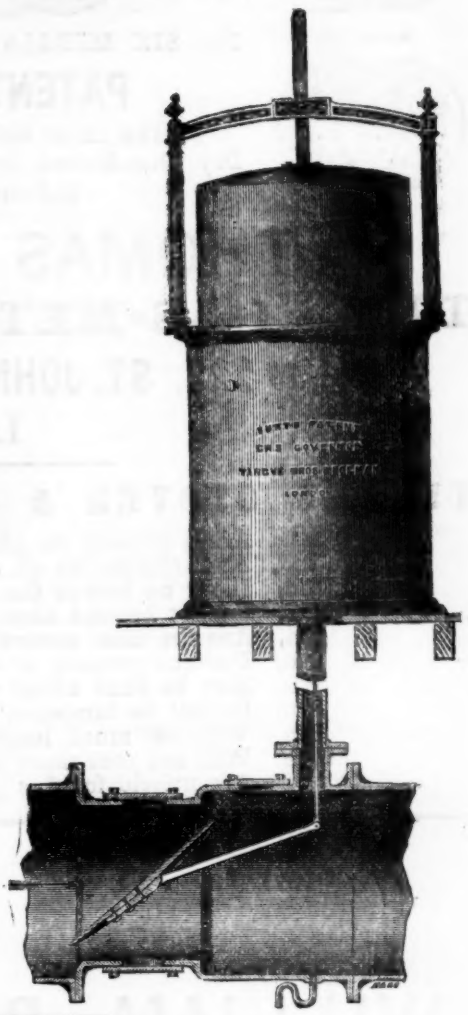
W. & B. COWAN'S large and constantly increasing Export Trade is provided for by their keeping constantly on hand a very large stock, both Wet and Dry Meters, ready for immediate despatch to the British Colonies and Foreign Countries.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Co.—two 36 in. at Blackfriars.
" " a 36 in. at Goswell Road.
" " a 24 in. at "
" " a 24 in. at Whitechapel.
" " an 18 in. at Bow Common.
" " a 24 in. at Beckton.
" " a 6 in. at "
The London Gas Co.—a 24 in. at Nine Elms.
" " an 18 in. at "
" " an 8 in. at "

The Exeter Gas-Works—a 24 in.
" Abergavenny Gas-Works—a 10 in.
" Birmingham Gaslight Co.—an 8 in.
" Monmouth Gas-Works—an 8 in.
" Devonport Gas-Works—an 8 in.
" Cannes Gas-Works—an 8 in.
" Mentone Gas-Works—an 8 in.
" Rochdale Gas-Works—a 4 in.
" Imperial Gas Co., a 12 in at Great Cambridge Street.

TESTIMONIAL.

The Gaslight and Coke Company, 9, Water Street, New Bridge Street, Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

VIENNA EXHIBITION, 1873.—The highest prize and only Medal "for Progress" for Direct-Acting Steam Pumps for general purposes was awarded to TANGYE BROTHERS AND HOLMAN, Engineers, London, for

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

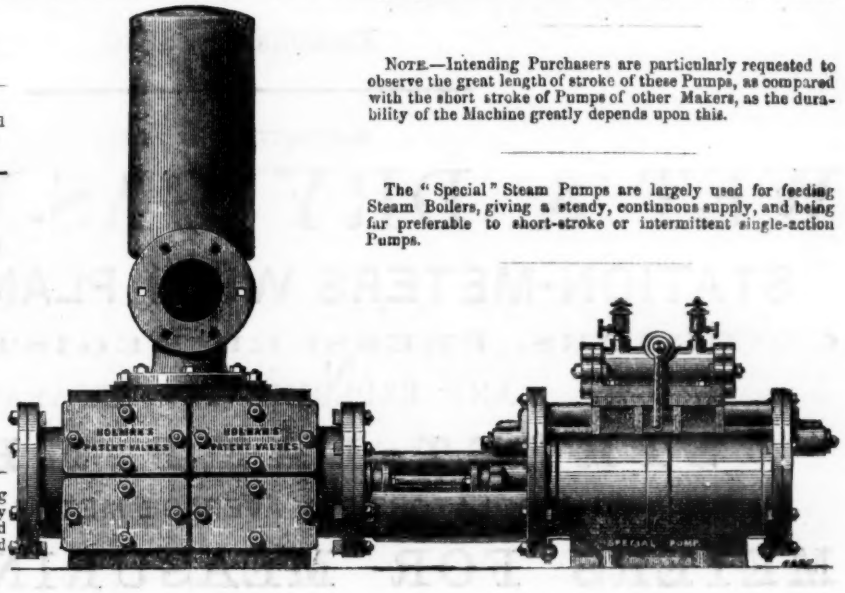
4000 have been sold since their introduction in 1867.

In use in over Ninety Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

The following are a few of the leading Sizes:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	550	£16
4*	2	9	970	18
3	3	9	2,200	18
5*	3	12	2,200	22 10
4	4	12	3,900	25
6*	4	12	3,900	30
5	5	12	6,160	32 10
7*	5	12	6,100	40
6	6	12	8,800	40
8*	6	12	8,800	50
7	7	12	11,900	50
10*	7	12	11,900	65
8	8	18	15,660	65
10	9	18	19,800	80
10	10	24	24,400	100
12	12	24	35,240	140

* These sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance piece between steam and pump cylinder at a small extra cost.



NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The "Special" Steam Pumps are largely used for feeding Steam Boilers, giving a steady, continuous supply, and being far preferable to short-stroke or intermittent single-action Pumps.

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 11, 1875.

Circular to Gas Companies.

The prospects of the Metropolitan Gas Companies (Regulations) Bill cannot be said to have improved. It stood on the paper for yesterday, but with so many Government measures before it, that a second reading, about the time we were going to press, was an extremely unlikely event. Should it have taken place, however, the chances are much against the passing of the Bill this session—that is, in its present form. A long contest before a committee of the House of Commons, to be followed by another of equal length before the Lords, if the Commons should pass the Bill, would inevitably precipitate it into the limbo of lost measures, after gas consumers and ratepayers had been saddled with costs amounting to many thousands of pounds.

The accounts of the Chartered Company for the past half year, furnished by the company to the Metropolitan Board of Works—an act of pure politeness on the part of the company, we believe—offered to Mr. Newton an opportunity he, no doubt, greatly desired, to continue his attacks on the company. It is greatly to be regretted that other than public motives provoke much of this dispute, and we think we shall best consult the tastes of our readers if, for the future, we decline to give publicity to the acrimonious personalities indulged in on both sides.

Mr. Newton started with the assertion that the revising clauses of the Act of 1868 afforded no protection to the consumer. Next, he said, that the company asked for 5s. 1½d. per 1000, and that the commissioners granted 5s., which looks as though the consumers had been considered to the extent of 1½d. per 1000. The decision of the commissioners was based on the price of coal, as shown in the contracts actually made by the company, and on the supposition that coal would probably be bought cheaper in the latter half of the year. As it turned out, an alteration in the market rates enabled the company to revise their contracts for the first half of the year, and make more advantageous ones for the second half. Thus the estimate of profit made by both company and commissioners has been largely exceeded. It is now known that 4s. 8d. would have been sufficient to pay maximum dividends, but no one could calculate on this in February, 1874, at which time, indeed, it appeared that the price granted would leave the company with a small deficit. The company, however, made better terms for coals, and the calculated small deficit was changed into a large excess of profit, which they were legally justified in carrying over to the next year's working, but which will most probably be returned to the consumer in the course of next year.

Mr. Newton says there is some "fallacy," which we altogether fail to see. The Revising Commissioners cut down the price of coals; the company, by exercising "due care and management," reduced the cost below the commissioners estimate, and hence the large profit. There is nothing extraordinary in this; it simply shows that the company were doing their best, under the circumstances.

The speaker went on to remark that it was strange that the commissioners should be entitled to give a price which would allow of maximum dividends, and a full insurance-fund. There is nothing at all strange about it. The commissioners were compelled to do so by clauses in the Act of 1868, inserted at the instigation of the local authorities.

As regards the general policy of companies alluded to by Mr. Newton, we shall say but little. It may be bad policy to charge high prices in periods of depression; but, then, it must be remembered that a restricted monopoly is scarcely a commercial venture. Tied down to a certain rate of profit, the companies are bound to maintain that rate under all circumstances. Mr. Newton seems disposed to rely on gas shareholders, and we think he may safely do so. Ensure them the profits they are entitled to under the Act of Parliament, and we will guarantee that the company will fulfil all their obligations, and sell gas at the lowest possible price. Harass them continually with attempts at adverse legislation, and they naturally will become reckless. The bogus notion of lavish expenditure of capital, simply for the sake of acquiring dividends, is the wild delusion of a jaundiced mind, and then possibly the Metropolitan Board may be open to a retort. We see, by their last week's financial statement, that the cash balance at their bankers was £1,327,903. They raised this money, or a large portion of it, we suppose, at about 3¾ per cent. Perhaps they get from the bankers 2 per cent. The difference comes out of the pockets of the ratepayers, without the smallest equivalent in the shape of service of any kind.

Something was, of course, said about the unfortunate Regulations Bill. The Parliamentary Committee of the Metropolitan Board have been to Sir Charles Adderley, and have endeavoured, through him, to persuade the Government to support the second reading of the Bill. Sir Charles (speaking, we rather think, without his book) appears to have made some sort of promise that the Government would support the Bill if the sixth clause were modified, so as to allow the scale of dividend to slide up as well as down. Now, we do not care about this, because, as we have have said, we regard 3s. 9d. as an impossible price in a not distant future, and the sliding would be all in one direction. At the present moment the coal trade is in a peculiar state, which promises well for the companies this year. But who knows how long it may last. Take one fact not without significance. The Board of Trade return for April shows an increase in the export of iron of nearly 10 per cent. The production of iron may be said to govern the price of coal, and if this increased demand go on, we may expect before the end of the year again to arrive at high rates.

An intimation has been made to the Board that the companies would accept the legislation of 1869—*i.e.*, 14-candle gas at 3s. 9d., with revision clauses. We think the offer a fair one; but it is objected to, inasmuch as Mr. Newton supposes that gas companies would, under no circumstances, charge less than the maximum price. The suspicion is perfectly unjustified.

Lastly, Mr. Newton has a suggestion to make. He objects to the upward sliding scale, and proposes that surplus profits with a price below 3s. 9d. should be allowed to accumulate in a reserve-fund, until it reaches 5 per cent. of the capital, the fund being intended to equalize dividends. We presume that the speaker was aware that under the Act of 1868 the Chartered Company have power to charge 3s. 9d., and apply surplus profits, to a limited extent, to an insurance-fund equal to what Mr. Newton proposes. Whether he would allow a reserve-fund in addition to an insurance-fund, we do not know; but, supposing he did, the two funds together, at their maximum, would only amount to the reserve-fund allowed by the Gas-Works Clauses Act, 1847. The

proposal is altogether unsatisfactory, and cannot for a moment be listened to. We must have one of two things—4s. per 1000 and revision clauses, or the prices of 1860.

We have only one more remark to make. The financial part of Mr. Newton's speech was only the preface for a reply to the speech of the governor of the Chartered Company, delivered at the last half-yearly meeting. We regretted at the time the warmth of expression indulged in on that occasion, and we feel no surprise at Mr. Newton's anxiety to reply. Both sides have now had their say; and, for the future, we may state, that no personal recriminations of the sort will find a place in our columns.

The gas accounts of the Corporation of Rochdale, for the year ending March 31, show a very satisfactory result. The gross profit of the year amounts to £14,230, which, after providing for the interest on loan account and the sinking-fund, leaves a surplus profit of £6070. Corporations, unfortunately, will not make up their gas accounts in the form we wish—that is, in the form prescribed by the Board of Trade for the metropolitan gas companies, which would enable us to compare the conditions of their undertaking with others. In this case, however, a few calculations will, with assistance, give us all we require. The quantity of coal and cannel carbonized amounted to 22,956 tons, and the average yield of gas was a little over 10,000 feet per ton. The total make was 231,496,000 cubic feet, and the quantity sold and used was 204 million, showing something over 8 per cent. unaccounted for, which is a very reasonable loss. The working expenses have been about 1s. 1d. per ton, which is also very satisfactory. The illuminating power of the gas supplied ranged, we believe, from 18 to 19 candles, and thus the gas may be considered cheap at an average price (discounts being allowed) of 4s. 6½d. We shall publish the accounts in our next; but, as a good deal is said about the capital of gas companies, we may now point out the fact that the capital at present engaged in the Rochdale works amounts to about £5 10s. per ton of coal carbonized. It must be added, however, that the works are practically new, and in the best possible condition. The working results reflect great credit on the management of the undertaking.

The Corporation of Manchester have resolved on proceeding with the erection of their new gas-works on the site near Phillip's Park, and we do not blame them. A more unreasonable outcry was never raised than that made against this site. We say *more* unreasonable, because we have in our minds the opposition made, on the same sentimental grounds, to the erection of works by the Imperial Company near Victoria Park. That opposition was successful, and the gas consumers now pay for the success. Gas-works, we may repeat, are not necessarily prejudicial to vegetation. In many places beautiful patches of greensward may be seen within the walls of gas-works—we mean carbonizing works. Gas leakage is said to have killed a tree on the Thames Embankment. We have in our columns repeatedly published statements, and the results of experiments, showing that, when the earth around the rootlets is saturated with gas, the tree quickly dies. With this information before them, the Metropolitan Board should have planted their trees at a respectful distance from gas-mains.

Another large gas undertaking has passed from the hands of a company into those of a Corporation. The Town Council of Southampton have, by a majority of three, ratified the bargain made with the gas company by the mayor, and, if no obstacle arise in Parliament, the transfer will immediately take place. The price to be paid is 24 years purchase of maximum dividends, which, in this instance, is equivalent to £188 for every £100 of capital. We regard the bargain as a fair one; and if the undertaking be as well managed by the Corporation as it has been by the company, and profits be properly applied, the transfer must prove advantageous to the gas consumers and the town generally. There has been, we are happy to see, no talk of making extravagant profits for town improvements. Calculated on the basis of the last year's accounts of the gas company, the undertaking will yield to the Corporation a surplus profit of £800 a year. But consumption increases rapidly in Southampton, and a few years will find the position of the Corporation in this respect much improved. Their first desire should be to reduce the price of gas, which is now 4s. 6d. The Mayor of Southampton is evidently a prompt business man. He has already made arrangements for borrowing the purchase-money of the Bank of England, so the shareholders will soon be paid out, and be perplexed what to do with their money. The scarcity of really sound investments, paying a good interest, always makes us regret these transfers; and we need hardly say that we prefer the payment of the consideration by way of annuities, rather than in a lump sum.

The gas agitation in Swansea induced the Corporation to go to the expense of fitting up a testing station on the most approved plan, and to appoint a gas examiner. The report of that gentleman for the month of April is before us, and it shows clearly that consumers in Swansea have nothing to complain of. The illuminating power prescribed by the Swansea Gas Act is 11 candles. In the month of April it averaged 14·80 candles, and the lowest was 13·61 candles. As regards purity, the condition of the gas was eminently satisfactory. The sulphur averaged only 16·45 grains per 100 feet, and the ammonia 1·1 grain. Sulphuretted hydrogen was totally absent. Surely, after this statement, the mischievous agitation kept up, we believe, by a few newspaper writers ought to cease.

That noble amateur fireman, the Duke of Sutherland, lent the other day the ground at Stafford House for an exhibition of the manufacture of "A New Heating Gas." We fail to see any novelty in the gas. It, or rather a portion of it, is obtained by decomposing steam by the aid of incandescent peat charcoal, which, of course, produces carbonic oxide, carbonic acid, and hydrogen. The peculiarity of this invention, however, is that a current of atmospheric air is driven through the furnace along with the steam. Furthermore, it must be explained that one furnace generates and superheats the steam, and, at the same time, yields the gas, the composition of which is said, on high authority, to be as follows:—

Carbonic oxide	28·6
Hydrogen	14·6
Nitrogen	53·0
Carbonic acid	4·0
	100·2

It is averred that 200,000 cubic feet of this gas may be produced from one ton of charred peat, representing, no doubt, tolerably pure carbon. We have no time to go into the calculation, and shall not dispute the figures; but it may be pointed out, that more than one-half of this gas is incombustible, and that, when used for heating purposes, it must receive a large addition of incombustible gas; and hence we assume that the heating power of the gas, when burnt, will be relatively small—in fact, we have a strong suspicion that the charred peat may be burnt to better advantage. The prospectus states, that "Peat gas, from "its cheapness, its purity, and the simplicity of its manufacture, "*must entirely* supersede the use of coal gas" (for heating purposes). We do not think gas shareholders need faint at the announcement.

Water and Sanitary Notes.

As far as Private Bill legislation is concerned, Parliament is making fair progress. The Leicester Water-Works Bill has been passed by the Lords committee, but in a somewhat mutilated condition, and, on the whole, it must be admitted that the Corporation have gained a great advantage. They succeeded in reducing the amount of new capital, and also in obtaining power to raise money to take up their proportion of this new capital. Under the circumstances, it seems clear that the undertaking cannot be kept long out of the hands of the Corporation, and before the time arrives for another application to Parliament, we should hope satisfactory terms of purchase may be arranged. The undertaking is such that it must command the highest price.

The Peterborough Water Bill was somewhat perfunctorily rejected by the committee of the House of Commons, but the result must have been anticipated. The case, from the first, was altogether hopeless.

The Stockton and Middlesbrough Water Bill, we are sorry to say, has been lost, for reasons which will appear in our report of the proceedings, which we hope to publish next week.

The Truro Water Bill has, somewhat to our astonishment, succeeded in the House of Lords. We presume that no opposition will be offered in the Commons, for the local authority have been refused permission to spend public money in opposing the Bill. The water scheme of the authority has utterly failed. They have wasted a lot of money in sinking a well where no water was to be found, and, as a desperate resource, they proposed to tap a stream, the water of which was largely contaminated. The company, it is said, have a source which will afford an efficient supply of good water. But it is alleged that the company is a myth, and that the only object of the promoters of the Bill is to sell their scheme to the Corporation at a profit. We do not admire such transactions; but in this case the Corporation, having failed ignominiously with their own scheme, could not, perhaps, do better than make the best terms they can for the purchase of the company's.

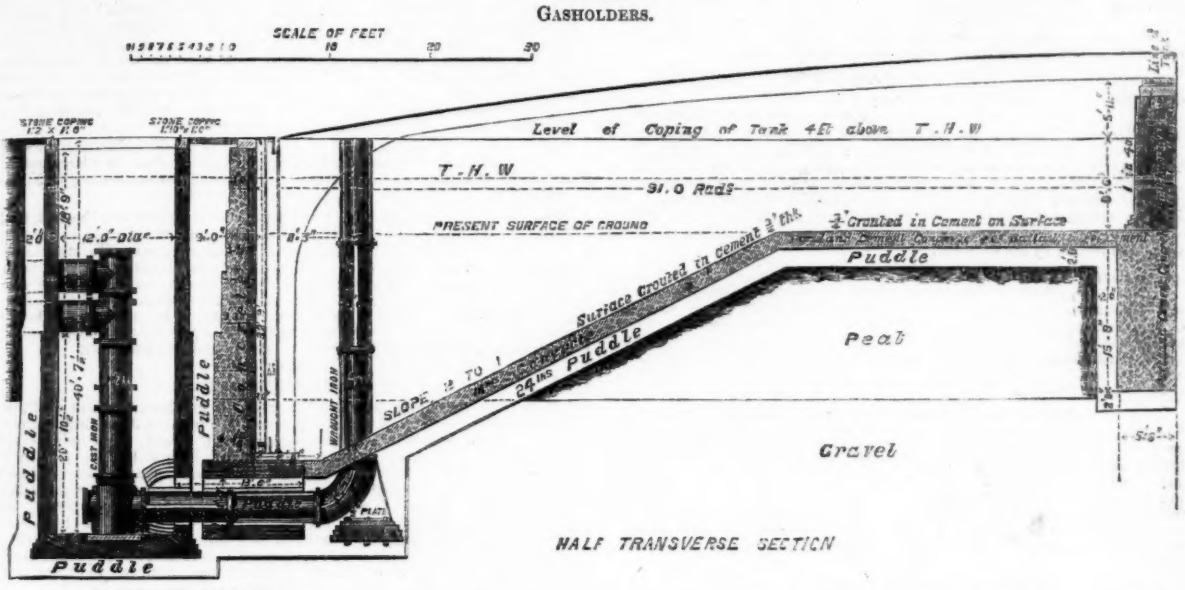
As a rule, the medical inspectors of the Local Government Board go down into the country with a stock of complaints and recommendations ready to hand. In the first place the water supply, especially if it is in the hands of a company, must be found fault with. Then the town must be sewered; privies and pigs must be abolished, shallow wells must be shut up, and ash-pits

emptied at short intervals, with unintermittent regularity. With such notions in his head, no doubt, Dr. Ballard went to Wednesbury. In this place every unsanitary abomination seems to exist in perfection. Every house is damp, there is no drainage, privies are badly constructed, far too large, and seldom emptied, and ash-pits are often saturated with the overflow from the privies. Besides all this, the inhabitants are so filthy as to keep pigs, and, moreover, shallow wells are abundant. But, with all this, the death-rate in Wednesbury is just about the same as it is in this thoroughly drained and well-cleansed metropolis. The single redeeming feature in the sanitary condition of Wednesbury is a liberal supply of wholesome tap water by the South Staffordshire Company. Now, we must beg that, when Dr. Ballard reports to the Local Government Board, he will not pass lightly over this case. Here is a locality—we cannot call it a town—under the very worst sanitary conditions (with one exception), and the death-rate is just the same as it is in a town or city under the best conditions. We hope that Dr. Ballard will tell us the reason of this. Are the inhabitants of Wednesbury regularly employed and well fed?

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

LXIII.

GASHOLDERS.



Through the courtesy of Mr. F. J. Evans, we are able to-day to print the specification for a tank designed and constructed by him at the Beckton works of The Gaslight and Coke Company, and to illustrate it with an engraving of a section of one-half of the tank. We believe the same description of tank has been built at the Bow Common station. The conditions of this specification are remarkably clear and definite, and will serve admirably as a model for any similar contract. We intend, in an early number, to give the substance of other specifications, with drawings, prepared by Mr. Kirkham, Mr. Livesey, &c., which they have handsomely placed at our disposal; and we gladly embrace this opportunity to thank these gentlemen, as well on our account as on behalf of the large body of the younger members of their profession, to whom their liberality in thus displaying the results of their skill and experience cannot fail to be of important service.

While doing so, memory carries us back to the time when it was considered that concealment in such matters was the highest wisdom, and when gas engineers guarded the secrets of their profession as jealously as did the ancient alchymists. It is not so long past when, as some of our readers may recollect, even the *employés* at a station or works—as clerks, inspectors, &c.—were strictly forbidden to trespass beyond the porter's lodge, under pain of incurring the displeasure of the chief of the establishment, whilst any desire evinced to acquire information concerning the art and mystery of gas manufacture was met by a curt intimation to "mind your own business." Such, at least was our experience, and we have frequently heard corroborations in the experience of others.

The specification which follows refers, as will be seen, to a tank which, in general dimensions, corresponds with the one given in our last number, and which, it appears, Mr. Evans has adopted as a standard in all his recent constructions. In other respects it differs materially, for instead of being entirely built of brick, it has only a facing of that material, as shown in the drawing, and is backed with concrete to the desired thickness, for the purpose of ensuring strength. This system has been adopted on economical grounds, as the ballast for the concrete is taken from the excavation, and enters at once into the formation of the tank, thus avoiding the necessity for the purchase and transport of bricks, and the expense of carting away the surplus ground.

THE GASLIGHT AND COKE COMPANY.

SPECIFICATION FOR BRICK TANK AT BECKTON WORKS,
182 feet diameter by 32½ feet deep.

Conditions.

Nature of Contract. The contract is to include the provision of all materials, labour, cartage, tools, scaffolding, timbering, engines, pumps, tackle, plant, temporary buildings, offices, houses, and every detail for completing the works shown on the drawings, described in the specification, and set forth in the schedule of prices for additional works, hereto annexed.

Setting out Works. The contractor must set out the works and provide the necessary means for so doing, and must satisfy himself as to the accuracy of the same, as he will be responsible for any error in the form of the works.

Mode of Operation. The works must be carried on during their progress with care, energy, and diligence, and conformably to the working and detail drawings and instructions to be furnished from time to time by the engineer.

Works Carried on under Control of Engineer. The works are to be performed under the control and supervision of the engineer, or such person or persons as may be appointed for such purpose from time to time; and the contractor must execute without delay all orders and instructions given by the said engineer or his deputies, whose decision upon all matters will be final. All orders for new or altered works will be made in writing by the engineer, without which no such works can be passed and allowed for in the settlement of accounts.

Materials. The whole of the materials delivered by the contractors upon the site of works to become the property of the company from the time of delivery, and shall not be removable without the engineer's consent. All materials disapproved of by the engineer shall be removed from the site of the works within 48 hours of the contractor receiving notice to that effect, and he must provide others of approved quality in lieu thereof. Any works which may be discovered as having been built of defective materials, the same shall be removed and reconstructed. In case of the contractor not complying with the requisitions of the engineer, he shall have full power to remove the materials, and substitute others in their place, and charge any expense to the contractor.

Alterations in the Works. In case the company shall consider it desirable to alter any portion of the work, adding to or diminishing the amount thereof, or changing one kind of material for another, thus deviating from what is delineated on the contract drawings and stated in the specification, the same shall not vitiate the contract, but shall be executed under the conditions of this specification, and measured up and paid for at the schedule prices annexed hereto; or, where no price is affixed for the work, the same shall be valued by the engineer, whose opinion thereon shall be final. The value of such works shall be accordingly added to or deducted from the amount of the contract.

Monthly Statement of Extras and Materials Delivered. The contractor is required to furnish a monthly statement to the engineer of all extras or departures from the contract, or the same will not be brought into the final settlement. He will also be required to deliver to the engineer monthly a stock account of all materials delivered and used by the contractor upon the works during the preceding month.

Damages to Works. The contractor must guarantee the company harmless against all accident or damage to the company's property or works, or the properties and works of others, during the progress of the contract and incident thereto; and any resulting expenses or damages which may be incurred by the company on account of any actions which may be defended by them, the contractor shall pay on demand to the company, or the same may be deducted from any balance due to the contractor by the company.

Progress of Works. Should the progress of the works not be deemed satisfactory at any time by the engineer, he may put on more force and materials to expedite the same; and in so doing he may use the contractor's plant and materials on the ground, and deduct the cost of such proceedings from any balance due to the contractor. Such operation on the part of the engineer shall not relieve the contractor from any liabilities under the contract.

Maintenance of Works. The contractor shall maintain and uphold the works in an efficient state for 12 months from the time of completion, as certified by the engineer, and shall then hand them over to the company sound and efficient, making good all defects, failures, accidents, and damages from any cause whatever during such term. Any reparation performed

by the company during the maintenance, in consequence of the contractor failing to do so, shall be charged to the contractor.

Measurements. All measurements for quantities and estimates will be based upon the net dimensions shown on the drawings, excepting for excavations for trenches and foundations, which will be taken as the net width and length of the foundation, with 6 inches added thereto.

Payments. Payments will be made monthly upon the amount of work performed during the preceding month, and within ten days after a sum equal to 80 per cent. of such work done and certified by the engineer shall be paid to the contractor, and the remainder will be retained as a drawback or security for the performance of the works. Ten per cent. of the gross amount of the certificates will be paid within three months, and the remaining 10 per cent. within 12 months of the certified completion of the works by the engineer.

Sureties. The contractor to find two sureties for the proper performance of the contract in the sum of £ , who will be jointly and severally bound to this amount.

Time of Completion. The tank works shall be completed by the and the gasholder works by the , and in default thereof the contractor will allow a discount off the gross amount of the contract of 1 per cent. for each week the works remain unfinished, such discount to be deducted from the balance due to the contractor by the company.

SPECIFICATION FOR TANK.

Description. The tank will be 182 feet in diameter between the walls, and 32 feet 3 inches deep from the floor to the top of the coping.

Excavation. The whole of the earth to be excavated to the depth shown, and timbered in the trenches of such form to admit of building the side walls to the dimensions shown on drawings, including the inlet and outlet well. The price of such excavation to include the necessary plant, timbering, engines, pumping (until the completion of gasholder), materials, and labour to complete the work to the satisfaction of the engineer, and also the spreading, leading, and forming the earth on any part of the site of the works, as may be directed by the engineer.

Surplus Earth. The whole of the surplus material excavated will remain the property of the company, but such portions of the same as may be fit for the concrete, mortar, or puddle of the tank works, in the opinion of the engineer, shall be at the disposal of the contractor free of expense. Should there not be sufficient of any or either of these materials to complete the work, such deficiency shall be provided by the contractor from other sources at his own expense.

Puddle. The clay for puddle excavated from the trenches at the Bow Common tank will be delivered free at Beckton, alongside quay; the unloading and delivery from thence into the works to be at the cost of the contractor. The puddle throughout to be 2 feet thick at least, and to be well worked up, turned over three times, chopped up with tools, well watered, and passed through a pug mill driven by engine power, before being used. It is then to be thrown into place from an elevation, and trodden in 9-inch layers uniformly at the back of the walls. Each layer to be chopped into preceding one, which is to be kept clean. A large quantity of puddle to be in course of preparation at one time, so as to ensure sufficient working and tempering to same.

Grouting. After the bottom of the foundations are levelled off, and the slopes to cone trimmed to a uniform slope of 2 to 1, and before any other material is placed on same, the whole to be twice grouted with thick clay grout, composed of clay and cement, in the proportion of ten of former to one of latter, diluted in water.

Brickwork. The whole of the brickwork to be composed of the best hard burnt stock bricks, sound, square, and of an even colour, and laid in Portland cement mortar. The work to be built to a gauge of four courses to a foot, laid English bond, grouted up solidly at every course, and pointed up neatly in Portland cement, either as the work proceeds, or at such time after completion as the engineer may direct. At every 4 feet 7 inches in height of the walls there will be hoop iron bond, in the proportion of one strip to each half brick in thickness of walls, 1-10th of an inch thick, 1½ inch wide, and well tarred and sanded. It is to be rivetted up in continuous lengths for the entire circumference of tank and well, and passing through the concrete pockets of piers and walls, and intersected by other bands of hoop iron. The walls of tank to be of the following dimensions, including the concrete backing. Breadth of footings to piers, 11 feet 9 inches by 9 feet 9 inches in length; breadth at wall panels, 9 feet 9 inches; depth of footings, 3 feet; the walls, from top of footings, for a height of 12 feet 6 inches, to be 4 feet 1½ inch thick; next, 6 feet 3 inches by 3 feet 9 inches thick; next, 6 feet 3 inches by 3 feet 4½ inches thick; and the next, 6 feet 3 inches; to the underside of coping, 3 feet thick. The piers, at every 24 feet 8 inches, from centre to centre round the circumference, to be 7 feet 6 inches by 7 feet 3 inches, formed of 9-inch walls on three sides, and filled with Portland cement concrete. In each of the piers there will be built the holding-down plates and bolts hereinafter described.

Cement Mortar. The whole of the mortar throughout the tank to be composed of one part of Portland cement, from a first-class maker, to three parts of sand, measured dry, and net, except where otherwise directed. The cement to weigh not less than 112 lbs. per imperial bushel, and to be tested from time to time by those in charge of the work, for cohesive strength and setting properties.

Concrete. The whole of the concrete to be composed of one part of Portland cement as above, and seven parts of gravel, measured dry and net. The gravel to be composed of four parts of coarse-screened stones, up to 1½ inch diameter, and three parts of sand. The materials to be mixed dry, first on a platform, then intimately incorporated with a sufficient quantity of water, then well turned over, thrown from an elevation into place, and levelled off. The concrete to the pockets of the piers and walls of tank to be deposited in 9-inch layers not exceeding 2 feet 3 inches in depth each day, and then levelled off and grouted. The concrete on cone to be 18 inches thick.

Stone. On the floor of tank, and under the centre of each post, there will be a stone, 4 feet 3 inches by 1 foot 6 inches by 9 inches. There will be three stones, each 2 feet by 1 foot by 9 inches, built in tank walls to the vertical line of each of the guides, at the positions shown on drawings, having two holes in each to receive two 1¼ inch diameter bolts. The coping stones to be 1 foot 10 inches by 1 foot in section, in stones not less than 3 feet long, and worked truly to the radius of tank. There will be a stone 7 feet diameter and 1 foot thick at the top of centre pier or cone, which will have nine 1 inch diameter bolts, 4 feet long, through the same. The stones under columns to framing to be each 6 feet 6 inches by 6 feet 6 inches by 1 foot. The coping to wells to be 1 foot 2 inches by 1 foot, in stones not less than 2 feet long, worked to the radius of same. There will be two 4-inch landings under inlet and outlet pipes in well, of an area of 5 feet 3 inches by 5 feet 6 inches each, and two 4-inch ditto, 5 feet 6 inches by 4 feet 6 inches, each under pipes in tank placed in pairs and jointed to each other. The whole of the stone except landings, to be of millstone grit, of sound quality, dressed, and fair tooled to beds, joints, and surfaces, and laid on the natural bed on a thin layer of cement without packing.

Well for Inlet and Outlet Pipes. The well to tank to be 12 feet in diameter inside, and 40 feet 7½ inches deep to the floor of same. The platform at bottom will be 2 feet 3 inches thick, with a 1 foot 2 inch invert formed in same. The first 20 feet 10½ inches of wall above the floor to be two bricks in thickness, and the next 18 feet 9 inches to underside of coping to be 1½ brick thick. Leading from the bottom of the well to the interior of the tank, there will be an arched chamber, 10 feet wide, 5 feet 9 inches high, and 13 feet 6 inches long, from the inside of wall of well, arched, 18 inches thick, side walls 3 feet thick, and inverted with an arch 1 foot 2 inches thick. The whole to be built in Portland cement brickwork, and when all is completed to be rendered on the inside faces of walls with a coating of Portland cement three-quarters of an inch thick.

Centre Pier. There will be a brick pier on concrete on the centre of cone. The concrete foundation to be 11 feet square and 15 feet 8 inches deep; on this will be erected the round brickwork pier with a diameter at the top of 7 feet 6 inches and batter sides of 1 in 40. At the level of 4 feet 2 inches below the top of gasholder dome there will be the stone previously described, 7 feet in diameter and 1 foot thick. On this stone there will be a double layer of 4-inch oak planking, formed of planks, spiked together, about 7 inches wide, of an area of 6 feet 6 inches in diameter, and laid at right angles to each other. There will be built into the pier, from the top of planking, nine 1 inch diameter holding-down bolts, 4 feet long, with proper nuts and washers, and held in the brickwork at bottom by six strips of wrought iron, each 6 feet 6 inches by 4 inches by ½ inch intersecting each other. The upper surface of planking must be faced and wrought to a true level to receive the bearing-plate attached to the underside of rafters, and spiked to the lower layer by 8-inch spikes, two to each plank transversely and for every foot longitudinally. The planking to be thoroughly tarred twice before being placed in position.

Cone. When the cone is dressed off to the form shown on drawings, and grouted with the clay grout, there shall be placed over the entire area of same 18 inches of concrete in Portland cement, resting on 2 feet of puddle.

Soundness of Tank. The contractor must undertake to deliver over the tank to the company at the time stipulated, sound, water-tight, in good condition, and to the approval of the engineer. He must also fill the same with water, and should the tank be found defective or leaky, and require to be emptied for remedying any defects at any time during the year's maintenance, the same shall be done, the defects made good, and the tank refilled with water, with all other necessary works, at the expense of the contractor. The contractor for the tank will have to perform the necessary pumping to keep the works dry during the construction of the gasholder.

(To be continued.)

THE LATE MR. JOHN EDWARD CLIFT.—This gentleman, whose death was announced in our last number, was in early life a pupil of John Brunton, engineer to the Birmingham and Staffordshire Gas Company, whose only works at that time were situated at Swan Village, West Bromwich. On Mr. Brunton retiring, Mr. Clift succeeded him as engineer to the company, which position he held for over 20 years, and during that time he designed and constructed a second station for the company, the Pagoda Works, in Adderley Street, Birmingham; but, the demand for gas increasing so rapidly, in 1858 he began a third station for the company at Saltley, near Birmingham. Under his management this company prospered greatly, paying a dividend of 10 per cent., besides accumulating a large reserve-fund. Mr. Clift was consulting engineer to the Lincoln, Gainsborough, and several other gas companies. In 1858 he resigned his appointment with the Birmingham and Staffordshire Company, and was invited to Redditch to construct gas-works there for lighting up the place, which he did on his own account. The town was successfully lighted in September, 1859. These works were turned over to a company three years back, and since that time he has retired from the profession through extreme illness. He was a great advocate for brick ovens, which bear his name, and are at work successfully at Lincoln, Grantham, Gainsborough, Weston-super-Mare, and several other towns. Mr. Clift was of a genial disposition and lively temperament, and his loss will be severely felt by a large concourse of friends.

BUENOS AYRES GAS COMPANY, LIMITED.—This company has just been registered, with a capital of £500,000, in £10 shares. The object is to acquire the undertaking established at Buenos Ayres under the name of "La Sociedad Anonina Consumidores di Gas," and to supply Buenos Ayres with gas.

HALIFAX (CORPORATION) GAS SUPPLY.—At the meeting of the Halifax Town Council on the 5th inst.—the Mayor (Alderman Crossley) presiding—a report was presented from the Gas-Works Committee, which stated that—

The quantity of gas manufactured during the year 1874 is 246,912,000 cubic feet. The quantity of coal and cannel used is 25,591 tons, which cost £17,893 0s. 5d.; lime, oxide of iron, for purifying, and tools and materials cost £1935 11s. 4d.; the wages and cost of maintenance amount to £19,363 19s. 4d.; the interest on money borrowed, the amount of sinking-fund, depreciation, bad debts, and discounts amount to £13,589 9s. 9½d.; being a total expenditure of £51,036 9s. 6½d. The income from all sources amounts to £56,495 11s. 0½d., leaving a net profit of £5459 1s. 5½d., or £2 13s. per cent. In making out the balance-sheet, the Finance Committee have deducted two years bad debts and discounts instead of one, thus reducing the profits for last year by £500. The council having accepted the resignation of Mr. G. D. Malam, as manager of the works, the committee decided to dispense with his services at once, and they have paid him his salary up to June 30 next. Mr. Malam left the employ of the corporation, on the 20th inst. The works are at present under the superintendence of Mr. Scholefield the sub-manager, and the committee are pleased to state that he is managing the works to their satisfaction, this being a time of the year when only a small quantity of gas is required. The committee have advertised for another manager, and have received 38 applications, but, for want of time, these applications have not been sufficiently examined to enable the committee to recommend any one to the council for the vacant situation, but they expect to do so at an early date. The gasholder No. 2, which is an old one, and has been in work 26 years, is now undergoing repairs. In making the estimate for the expenditure of the present year, the committee put down £500 for the repairs of this gasholder; they now find upon examination that it is in a much worse condition than it was supposed to be, and, from the best information they can obtain, the committee anticipate that the repairs will amount to about £1000. This expenditure will make the gasholder equal to a new one, and the committee have every confidence that they will be able to pay the whole of that amount out of revenue in the present year, without trenching upon or lessening the amount calculated by the Finance Committee to be received from the profits of the gas-works for the present year. The committee have long felt the want of an apparatus for testing the quality of coals suitable for gas-making, and have for some time back contemplated erecting one; but, in consequence of the large contracts for coals which have extended for a lengthened period, they have delayed ordering such an apparatus. Now, however, that these contracts are approaching completion, the committee recommend that a suitable apparatus for the proper and correct testing of gas coals should be provided, the expense of which they think will amount to about £500 or £600.

In moving the adoption of the report, Alderman Berry said the receipts from gas up to the 30th ult. showed a very nice increase upon the corresponding period of last year. The quantity of gas sent out was 3,000,047 cubic feet in excess of the corresponding quarter of last year, and the consumption of coals was 403 tons in excess of the same period last year. The receipts were, therefore, more in excess still, the gain upon the previous year being £1455, so that the prosperity of the works was manifest by these figures. The committee had long been persuaded that safety lay in the increase which could be obtained without increasing the cost in labour and plant. A long discussion took place on a motion by Mr. Shaw, that the Gas Committee be recommended to throw their contracts open to competition, the mover expressing an opinion that, if this course were adopted, 1s. per ton might perhaps be saved in the cost of coal, which would make a difference of £1200 a year. The motion was carried *nem. dis.*

Correspondence.

MALAM'S PATENT PROCESS OF GAS-MAKING.

SIR,—Mr. Somerville, of Dublin, must be very hard to please. In your last issue he writes that by the process he saves 14s. 4½d. per ton of coal used, and that with it he only required *one-half* the number of retorts he did with the old mode of working, and that the results, although satisfactory, are not so good as he had anticipated.

If he anticipated more saving than 14s. 4½d. per ton, he must be a very gourmand for economy. Mr. Somerville's facts, however, are all useless, because he does not give us the figures of the old working, any more than he does of the new. He may have done with *half* the retorts, and done nothing extraordinary after all.

I remember the Irish ironmonger who told a squire that if he would but use one of his patent grates, he would save one-half the coal he now used. "Faith, then," said the squire, "I will have *two* of them, and save it all." This was not good logic of the squire, neither is working with half the number of retorts any recommendation of Malam's process, without giving us such facts as Mr. Malam has himself given.

If Mr. S. will give us these, he may do a service both to Mr. Malam and to

GEORGE ANDERSON.

SIR,—Mr. Somerville, of Dublin, in your issue of the 4th inst., tells us he put in Malam's arrangement in some works he has on lease, and worked it for the quarter ending the 31st of March last, and the result has been a saving of 14s. 4½d. per ton of coals carbonized, as compared with the corresponding quarter last year, when working under the old system; and, further, he informs us that the yield of tar per ton of coals on this system is only about 7 gallons, instead of 10 gallons by the ordinary process; thus leaving it to be inferred that this 14s. 4½d. per ton of saving is the outcome of the conversion of the 3 gallons of tar into a permanent gas. If this is what he means, there must be, I confess, "a little haziness in the minds of some people North of the Tweed" in regard to this mysterious saving. Seeing that 3 gallons of tar would weigh about 30 lbs., and as 1000 feet of gas made from Newcastle coal (which, he says, was used in both cases) weigh about 37 lbs., he could only have had some 700 feet of gas as the product of the distillation of the 3 gallons of tar, even supposing it to have been entirely converted into gas. But if Mr. Somerville would favour us next week with answers to the following queries, he would still further assist in eliciting the truth regarding this vexed question.

Under the Malam arrangement—

The number of tons of coal carbonized weekly.

The yield of gas registered by the station-meter (corrected by the standard temperature and pressure).

The illuminating power of the gas.

The amount for coke sold for the 13 weeks ending the 31st of March last, and the same particulars over the corresponding quarter of last year on the old system.

As it is evident to Mr. Somerville that Mr. Smith and I "understand each other," I am hopeful that the same happy result would be effected relative to himself, if he would kindly furnish the desired information, which might also afford a little additional "food for reflection" to the redoubtable Mr. Smith.

LESMAHAGOW.

GAS PURIFICATION AND THE AMMONIA MANUFACTURE.

SIR,—In your issue of March 9, 1875, on page 333, you do me the honour to copy some portions of a professional report made by me in the summer of 1868—nearly seven years since—to the Manhattan Gas-light Company, of New York city. In doing so, through some mistake, you state that this report was "written two years ago," being unaware of the fact of its former publication, in entire form, in your own columns on Jan. 19, 1869 (vol xviii., p. 57), more than *six* years since.

Nevertheless, I am much pleased to have this opportunity of introducing to your readers a few words in discussion of two or three points in this report.

For the firstof these, I must refer back to the original publication in your columns in 1869, and would beg attention to a sentence in the introductory (some may call it theoretical) part, which is all omitted from your recent quotations. To wit:—

"We have shown above that the hydrosulphuric acid of the gas passes in the purifier into the form of sulphide of calcium (CaS), which, as shown long ago by Berzelius (Gmelin; ed. of 1843, vol. ii., p. 200), combines with sulphocarbonic acid (bisulphide of carbon) to a sulphur salt of considerable stability."

This was the first setting forth, in this form (so far as I have yet learned), of the *theory* of the mode of sulphur purification, afterwards worked out practically, and patented, under date of March 19, 1872, by Mr. Patterson, and which has given rise to so much discussion in your columns. I wish here also to take the opportunity to point out, as pertinent to the history of this matter, that your eminent chemist, Stenhouse, before 1860, made investigations on gas purification, with a view to remove bisulphide of carbon, and that he even filed a provisional specification in your Patent Office (July 19, 1860, No. 1752), in which he actually includes the use of *alkaline sulphurets*, in combination, however, with alcohol (or wood spirit, or fusel oil), his object being to form, with the bisulphide, *xanthates*, *xanthomethylates*, &c. Curiously, Dr. Odling, in a lecture delivered by him (and published in your columns), in the summer of 1872, speaks of his having himself, independently of Mr. Patterson, experimented with the sulphides of calcium and of the alkali metals, attributing likewise the reactions leading to the absorption of the bisulphide, to the formation of xanthic acid and xanthates, apparently without being aware of the previous publication of Stenhouse. As, however, alcohol, or some homologue thereof, must be present to form a xanthic compound, Dr. Odling's suggestions do not seem to fit the case. It seems much more probable that the action in the gas purifier is due simply, as first viewed by myself, and subsequently (as shown above) by Mr. Patterson, to the formation of the Berzelian *sulphocarbonate of calcium sulphide*.

The next point I would request leave very slightly to notice involves an admission, on my own part, of hasty and unwarranted conclusions; being those set forth in the first two paragraphs of your recent extracts. I have there stated that the composition of iron used by the New York Gaslight Company—that of St. John and Cartwright—contains "a common limonite ore;" and that when introduced into the purifiers in bulk, there is a less extent of absorbent surface, and hence an efficiency less than that of lime as used in sieves and hurdles. Both these assumption I found, as regards this special purifying composition, on subsequent thorough examination, to be in error; and this preparation has since been introduced into several of our gas-works. I must not occupy here, however, further space with a matter of only cis-Atlantic interest.

My third and last point is one which should have awakened new attention on your side the water, through the recent interesting report of Dr. Letheby (in your JOURNAL of Feb. 2, 1875). I refer to that part which relates to the nuisance from the *sulphate of ammonia* manufacture.

Unluckily, the special passage in the original of my report, in which I indicate, describe, and explain this nuisance, as then (in 1868) exemplified in New York, is one of those omitted from your recent extracts; and I shall have to refer your readers back for this also to your complete publication in 1869. (In the closing paragraph, however, of your extracts, there is a brief reference to this topic.)

I believe that I may claim—certainly so far as my own knowledge extends—to have been the first to point out publicly, in this report of 1868, the existence and the very grave character of this civic nuisance. It is only within a year past that our Metropolitan Board of Health in New York has taken up this matter of the ammonia nuisance, and what they will do with it remains yet to be seen.

It has appeared to me that it might be interesting and, possibly, instructive to some among your readers, to quote for them a paragraph which I clipped from one of our city journals, relating part of the history of this struggle during the summer of 1874:—

"One thing is puzzling the sanitarians now, and that is to discover whether the city gas-houses create all the nuisances which have been freely, but with much indefiniteness, ascribed to them. There was a hullabaloo about it a few weeks ago, but the gasmen invited the fullest inspection of their works, and Dr. Day says it was, at the least, difficult to trace the abominable smells that often filled the air of the east side, between Eighth and Thirty-fourth Streets, after dark to any processes in the gas manufacture. However, in examining the subject, it was found that the ammonia works, at Avenue B and Thirteenth Streets, contributed largely to the smell, and they were stopped. Then the smells stopped. The proprietor got new apparatus, with permission to use it, and began again. Suddenly people began to complain that the smells were renewed, coming into the house this time, however, by way of the sewer traps instead of a window. The ammonia man was dumping his refuse into the public sewer. That was stopped, and the smells stopped again. The ammonia man built a private drain and began again, and presently the smells began again. This was two weeks ago, and the works are now idle. The apparatus, it appeared, had got out of order, and new apparatus is preparing. This history is given merely as an example of how much fighting, how much persistence and patience it takes to reform any one nuisance of long date. The trouble is not so often that a man won't see, as that he can't see why his trade is a nuisance. If he won't see, he can be kicked out of the city, but if he can't see he must be instructed, which is a much longer process. The most difficult and worthy, and withal the most thankless, tasks of the health inspector lie among just such willing and benighted people—tasks which have been but little appreciated, but which do tell at length, if slowly, upon the immense bulky stupidity of a great city."

Hoboken, N.J., April 5, 1875.

HENRY WÜRTZ.

SCIENCE CLASSES.

SIR,—I should like to draw the attention of the young members of the profession to the many advantages for the acquisition of scientific knowledge, including the study of gas manufacture, which are held out by the "science classes" now established in nearly every town and village in the country, and to advise them by all means to attend such classes where they exist, or to be the means of establishing them in their own locality.

These classes hold out the best and cheapest means for the study of chemistry, electricity, steam, mechanics, geometry, drawing, gas, and many other subjects. They are under the supervision of the Science and Art Department, South Kensington, and examinations are held at the end of every session, when certificates and prizes are distributed to the students. Young men who have studied and obtained certificates, place themselves in a higher position than their fellows, especially when they become candidates to fill important positions in the profession.

The examinations for this session are now going on, and my advice is to set about preparing for the session of 1876. Teachers can generally be found if six or eight pupils can be guaranteed.

ROBT. DEMPSTER.

Rose Mount, Elland, near Halifax, April 30, 1875.

RIGHTS OF GAS COMPANIES.

SIR,—I read with great interest the case reported in your issue of the 20th of April, page 567, under the heading, "Rights of Gas Companies," as it involves a question upon which I should be glad to be fully informed, both as to the legally defined position and power of gas companies in such cases, and the best method of procedure for recovery of the debt. The point is this:—Whether in case of bankruptcy gas companies have any priority over ordinary creditors, and, refusing to consent to a liquidation, may enforce payment by summary proceedings. If some of your readers will enlighten me, I shall feel obliged.

A COLLECTOR.

EXHIBITION OF APPLIANCES FOR THE ECONOMY OF LABOUR.—This exhibition, which is being held under the auspices of the Society for the Promotion of Scientific Industry in Manchester, will be opened on the 14th of May by the Earl of Derby, president of the society, and the opening address will be delivered by Mr. John Anderson, LL.D., late the superintendent of machinery to the War Department. The exhibition will contain a very fine collection of engineers tools, wood working machinery, and other appliances, as may be gathered from the fact that Sir Joseph Whitworth and Co.; Sharp, Stewart, and Co; Kendall and Gent; Smith and Coventry; B. and S. Massey; Furness, of Liverpool, and other firms of equal eminence, are among the exhibitors. The second division is devoted to domestic contrivances. A large number of gold, silver, and bronze medals will be awarded, and Messrs. Richard Peacock, of Beyer, Peacock, and Co.; John Robinson, of Sharp, Stewart's; William Mather; Dr. Angus Smith; W. H. J. Traice; Professor Osborne Reynolds; and John Leigh, F.R.C.S., are the judges. The exhibition building is a fine structure, built on the same principle as the one last year, and it covers an area of over 50,000 square feet. About a dozen annexes for special purposes are attached, and not only will all the machinery be in motion, but the stoves, cooking ranges, gas-making apparatus, &c., will be shown in action.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, May 3, 1875.

The Lord Chancellor acquainted the House that the further Standing Orders applicable to the Alford Gas Bill have been complied with; that no further Standing Orders are applicable to the Slough Water Bill; and that the further Standing Orders applicable to the Portishead District Water Bill have not been complied with.

Report read from the Select Committee on the Pontypridd Water Bill, that the committee had not proceeded with the consideration of the bill, the opposition thereto having been withdrawn.

The Hindley Local Board, Ashton-in-Makerfield Local Board, and Pemberton Local Board Bills were referred to a Select Committee, consisting of Lord Silchester (chairman), Earl Jersey, Viscount Gough, Lord De Ros, and Lord Auckland; to meet on Wednesday, May 5.

Gas and Water Orders Confirmation Bill.—A petition praying to be heard against the Newington Water Order was presented from the Corporation of Kingston-upon-Hull.

A petition against the Ashton-under-Lyne, Stalybridge, and Dukinfield District Water Bill was presented from the Local Board of Mossley and Hurst.

Tuesday, May 4.

The Lord Chancellor acquainted the House that the further Standing Orders applicable to the Maidenhead Water Bill have been complied with; that no further Standing Orders are applicable to the Bradford Water and Improvement, and Rochdale Improvement Bills; and that the Standing Orders have not been complied with in respect of the petition for additional provision in the South Staffordshire Water Bill.

The Broadstairs Gas Bill, without amendment, and the Pontypridd Water and Colchester Gas Bills, with amendments, were reported.

The Ashton-under-Lyne, Stalybridge, and Dukinfield District Water Bill was read a second time, and committed.

The Carmarthen Gas Bill was read the third time, with the amendments, and passed.

The Chelsea Water, Longwood Gas, Pontefract Borough Extension, Rotherham Corporation, and Worksop Water Bills, brought from the Commons, were read the first time, and referred to the examiners.

Friday, May 7.

The Lord Chancellor acquainted the House that the further Standing Orders applicable to the Millom Gas and Water Bill have been complied with.

The following report of the Standing Orders Committee was agreed to:—That the Standing Orders not complied with, in respect of the Portishead District Water Bill, ought to be dispensed with, and the bill allowed to proceed, provided that the name of Charles Morris be struck out; that the Gas and Water Orders Confirmation Bill may, under the circumstances, be allowed to proceed.

Reports were read from the Select Committee on the Hindley Local Board and Pemberton Local Board Bills:—That the committee had not proceeded with the consideration of the bills, the oppositions thereto having been withdrawn.

The following bills were reported, with amendments:—Ashton-in-Makerfield Local Board, Truro Water, Leicester Water, Oxford (Corporation) Water, Cleethorpes Gas, Pemberton Local Board, Hindley Local Board.

The Alford Gas Bill was read a second time, and committed.

The Market Rasen Water Bill, brought from the Commons, was read the first time, and referred to the examiners.

Petitions against the Bradford Water and Improvement Bill were presented from (1) Overseers of the poor of the Bradford Union, (2) Sir H. J. Tufton.

HOUSE OF COMMONS.

Monday, May 3, 1875.

The Longwood Gas, Pontefract Borough Extension, and Rotherham Corporation Bills were read the third time, and passed.

The Market Rasen Water Bill, as amended, was considered; to be read the third time.

The Cardiff Improvement Bill (Lords) was read a second time, and committed.

A petition against the Metropolis Gas Companies Bill was presented from the Langholm Gaslight Company.

A petition against the Cardiff Improvement Bill (Lords) was presented from Charles Kemeys Kemeys Tynte.

A petition in favour of the Broadstairs Water (No. 1) Bill, and against the Broadstairs Water (No. 2) Bill, was presented from the inhabitants of St. Peter's; and one against the Broadstairs Water (No. 1) Bill, and in favour of the Broadstairs Water (No. 2) Bill, was presented from owners, &c., of land in St. Peter's.

Tuesday, May 4.

The Worksop Water, and Chelsea Water Bills were read the third time, and passed.

The Manchester Corporation Water and Improvement Bill, as amended, was considered; to be read the third time.

Metropolis Gas Companies Bill.—The second reading of this bill was deferred till Thursday, May 6.

Wednesday, May 5.

The Newport (Monmouthshire) Gas Bill, as amended, was considered; to be read the third time.

The following bills were reported:—Greenock Water (Lords), with an amendment; Hamilton Water; Busby Water; Worthing Gas.

Thursday, May 6.

The Market Rasen Water Bill was read the third time, and passed.

Metropolis Gas Companies Bill.—The second reading of this bill was further deferred till Monday, May 10.

RIVERS POLLUTION COMMISSIONERS.

Dr. Lyon Playfair asked the President of the Local Government Board whether his predecessor in 1872 received replies from some eminent chemists, including Baron Liebig, M. Dumas, Dr. Hofmann, Sir Benjamin Brodie, Dr. Williamson, Dr. Odling, and others, to the following (abbreviated) questions put by the Rivers Pollution Commissioners, viz.:—1. Is it desirable, in the interest both of manufacturers and the public, that a definition of standards of polluting liquids should be fixed by Parliament? 2. Are the standards recommended by the commissioners fair and reasonable? and whether he has any objection to lay their letters before Parliament, previous to this House being asked to consider the Rivers Pollution Bill.

Mr. Sclater-Booth stated that the replies of Baron von Liebig and M. Dumas would be found in the fourth part of the Fourth Report of the Commissioners. With regard to the reports in continuation laid on the table of the House, but not yet distributed, he had to state that the last revise would be in the hands of the printers within a few days, and he hoped they would soon afterwards be in the hands of honourable members.

Friday, May 7.

The following resolution was reported from the Standing Orders Committee:—That, in the case of the Neath Water, petition for leave to deposit a petition for bill, the Standing Orders ought not to be dispensed with.

The Birmingham and Staffordshire Gas Bill, as amended, was considered; to be read the third time.

The Birmingham (Corporation) Gas Bill, as amended, was considered; clause added; amendments made; to be read the third time.

The Birmingham Gas (No. 1), Birmingham Gas (No. 2), and Marlborough Gas Bills were reported.

The Stockton and Middlesbrough Water Bill was reported; preamble not proved.

BIRMINGHAM (CORPORATION) WATER BILL.

On the consideration of this bill, as amended,

Mr. Raikes rose to call attention to the special report of the select committee to whom the bill was referred. They reported that the 63rd section of the Birmingham Improvement Act, 1851, which provided that a public meeting of the ratepayers should be called, had not been complied with. The committee, however, reported that the promoters had no intention of proceeding against the wishes of the ratepayers, or of evading the provisions of the Act of 1851, but that they did not call the ratepayers together at an earlier date because negotiations were in progress with the water company. He did not propose to offer any opposition to the action of the select committee, but it was desirable that the House should guard itself against setting up a new precedent by allowing the promoters of a bill to avail themselves of a private Act to set aside the provisions of a public Act.

Mr. W. H. Gladstone, as chairman of the select committee, stated the reasons which had induced the committee to make a special report. There was no reason to suppose that the ratepayers objected to the bill, and he trusted that the House would not refuse to assent to so useful a measure.

The bill was then ordered to be read the third time.

HOUSE OF LORDS COMMITTEE.

Wednesday, April 21.

(*Before the* Earl of Airlie, *Chairman; Earl* Manvers, *Earl* Minto, *Lord* Abercromby, *and Lord* Colchester.)

SOUTH STAFFORDSHIRE WATER BILL.

Mr. Bidder, Q.C., and Mr. Webster appeared for the promoters; Mr. Aspinall, Q.C., and Mr. Chandos Leigh for Earl Sydney and the Marquis of Anglesea; Mr. Burnett for the Cannock Chase and Rugeley Colliery Company; Mr. Castle for Lord Hatherton; Mr. Richards, Q.C., for the London and North-Western Railway Company; Mr. Pope, Q.C., Mr. Warington, Mr. Richards, and Mr. Michael for the Tipton Board; Serjeant Sargood for Smethwick Local Board; Mr. Gates, Q.C., for Oldbury Local Board; Mr. Mundell, Q.C., for Walsall, Sedgley, and West Bromwich Local Boards.

Mr. Bidder said this was a bill to extend the works and area of supply of the South Staffordshire Water Company, in consequence of the increasing wants of the district. The district was mostly inhabited by a mining population, which was rapidly increasing every year. In 1853 the South Staffordshire Water Company were incorporated, and supplied water in a district lying between Lichfield and West Bromwich; Lichfield being the main source of supply. The water was obtained from streams in the neighbourhood of Lichfield and from subterranean springs. Reservoirs were erected at Lichfield and Walsall and several other places at that time. In 1857 the company again came to Parliament for powers to extend their district, including Smethwick. In 1860 the company purchased the Dudley Water Company—an arrangement which turned out very advantageous to Dudley, as they got a large additional supply. The Dudley reservoir at Shaver's End was, however, 560 feet above the level of the Lichfield watershed, so that every drop of water supplied to that district had to be pumped half as high again as St. Paul's Cathedral. In 1864 application was again made to Parliament for the purpose of constructing a reservoir at Seedy Mill, and taking water from the river Bourne; and in 1866 power was given to make another reservoir at Haring Blow, for the accommodation of the town of Burton, and also of Cannock Green. Since then the population of the district having increased to nearly half a million, it became absolutely necessary that they should extend the area of their supply. The company had been authorized to raise capital to the amount of £400,000, and had already raised £335,000, and £3000 by debentures. The company's district extended for 30 miles, and the only source of water supply was from Lichfield; and the underground springs they had already tapped, and from this source they supplied 26,000 houses, the average water-rate of which was 14s. 4d. per house. There was no chance of getting any more water from the neighbourhood of Lichfield, and therefore they had to consider where they could get a fresh supply from. In the district of Cannock Chase, during the sinking of a shaft by the Cannock and Rugeley Mining Company, it was found that they had to go through some beds of gravel, which contained such a copious supply of water that it was with the utmost difficulty they could get through it. The Staffordshire Company at once instituted all proper inquiries, and found this water was unquestionable in quality, and would form a source of permanent supply. The promoters therefore asked their lordships to allow them to utilize this new source of supply, by sinking two shafts, and establishing pumping stations at Huntington and Hednesford, and also making a reservoir of Scout House. They also proposed to supply this district with water, which at present had no regular supply. There was only one other thing they asked for in this bill, and that was power to put up a new reservoir at a higher level for the supply of Oldbury. It was somewhat surprising that in endeavouring to do such a very necessary thing as increase the water supply of the district, they were opposed by so many petitioners. Lord Hatherton objected to the bill on the ground that some of the necessary works might be made on his estate at Tiddesley; that the proposed new pumping station would be an unsightly object; but the promoters agreed not to sink any shaft upon his lordship's estate, or to build a chimney exceeding 80 feet in height. The only thing which would affect Lord Hatherton at all was laying a main down through a portion of his estate. The next petition was from Earl Sydney and the Marquis of Anglesea, which complained that the proposed works would damage a well-known training-ground; whereas the truth was that it would only touch a very small corner of it; and also, that the sinking of the company's shaft would have the effect of taking water from the Hednesford Pool. Now, if this was true, the company would abandon their bill at once, because the quality of the water was so bad that it was not fit for a dog to drink. The Cannock and Rugeley Coal Company opposed on the same ground as the Marquis of Anglesea; and Mr. Burnett, a millowner, of Hednesford, who also complained of the danger that would result from draining Hednesford Pool. There was another petition from the London and North-Western Railway Company, which alleged that damage would be done to their property by laying down pipes and mains, &c., and also that if the bill was passed, the promoters ought to be compelled to supply the railway company at the rate they were now supplying water to a portion only of their line. Then came a petition from the Corporation of Dudley, together with petitions from seven or eight or ten local authorities, whose duty it was to see their districts were properly supplied with water. Now, as the company already supplied Dudley with water, he submitted that they had no *locus standi*, unless they complained either of getting an insufficient or an indifferent supply.

Mr. Richards maintained that it was the duty of his clients to see that there

was a proper supply throughout the whole of the district over which they had jurisdiction.

Mr. BIDDER replied that the object of the promoters was to increase the present supply.

The COMMITTEE, after consideration, decided against the *locus standi* of the Dudley Corporation. They also, after hearing Mr. Michael, decided in favour of the *locus standi* of the Tipton Local Board. The *locus standi* of Smethwick and Oldbury was disallowed, and that of Sedgley and West Bromwich was admitted.

Mr. BIDDER withdrew his objection to the *locus standi* of Walsall.

Mr. *Frank James*, chairman of the South Staffordshire Water Company, examined by Mr. WEBSTER, said he had been a director of the company for 22 years. Their district extended about 35 miles, including most of what was called the Black Country. The population of this district was between 400,000 and 500,000. The company supplied upwards of 26,369 houses, and the average quarterly charge for the whole was not 3s. 9d. The bulk of the supply was to the poorer portion of the people. The capital actually subscribed was about £416,000, and the average per centage was not over 2½ per cent. Looking at the increase of the population, the company had long been convinced that they should look out for a fresh source of supply. They now proposed to go to Cannock Chase, and, assuming water to be found there, it would flow down by gravitation to the company's pumping station at Wood Green. Water from Cannock would supply Bloxwich and Walsall. It was proposed to sink shafts at Hednesford and Huntington. At all spots the quality of the water was excellent, and well suited for domestic purposes. It was proposed to construct a reservoir at Rowley Regis, in order to keep up the high level supply in the event of failure at other places.

Cross-examined by Mr. LEIGH: Most of the district alluded to in the bill was the property of either Lord Anglesea or Lord Hatherton. It was a good mineral property. At present the company had no experience of inconvenience arising from supplying water, but they were every day receiving applications to extend their area of operations. They now supplied for domestic purposes about 24 gallons per head per day. In short, they gave a constant supply. He did not know that in some northern towns the supply was only 15 gallons per head.

By Mr. LEDGARD: At the present moment Walsall was supplied with water by the company. Bloxwich was within the company's limits, but they had not laid any mains there. The people of Bloxwich could, however, compel them to give them water, provided they applied for it under the 34th section of the Act. They could not be provided by the district service reservoir at Walsall, but from the pumping station. The company were bound to give them water if it was applied for. The best pumping stations for Bloxwich would be at Hednesford and Huntington.

THURSDAY, APRIL 22.

Mr. *James* recalled, and cross-examined by Mr. RICHARDS, said he was well acquainted with Lord Hatherton's estate. They did not intend to take water from any springs on the Tiddesley estate. They would be quite willing to give a clause not to sink any shaft on Lord Hatherton's property. The shaft they proposed to sink would be at Huntington, a place which was in the centre of his lordship's property. The company first turned their attention to Huntington and Hednesford as a source of water supply early in the year 1874. Had they communicated with Lord Hatherton before November, he would, no doubt, have had an opportunity of suggesting another scheme; but it was very doubtful whether it would have answered their purpose so well as the present one. At present the maximum supply they could get from their existing springs was about five million gallons per day, and he thought it was prudent to provide for five million more. Professor Ramsay had reported on the supply to be got from both Hednesford and Huntington. It was made on the 25th of November, 1874, and referred specially to the rainfall on the chalk at King's Stanley, which was about 1200 millions for 10 square miles. He believed that more would percolate through a gravel than a chalk soil. It was calculated that they could get about two million gallons a day from Huntington, and three million from Hednesford. It was proposed to sink a shaft for a colliery at Huntington. They had made three large bore-holes, and had experienced a great deal of difficulty from the water rising. He was not aware that Lord Hatherton had a dispute with the colliery company as to the disposal of this water. The promoters would sink their shaft about 300 yards from this colliery, and, if they did so, no doubt they would take off a great deal of water from the mine. He did not know how Tiddesley Hall was now supplied with water, but was of opinion that their scheme would not affect it.

By Mr. THOMAS: The company now supplied 24 gallons of water per head. That was, they supplied 25,858 houses, or 129,290 gallons. A great deal of their water was stolen from them, and they found it almost impossible to prevent it. On a recent survey at Dudley, it was admitted that large quantities were taken from the nearest taps of the company. Unfortunately they had no power to compel persons to take their water. In the last two years there had been a very large increase in the number of houses supplied, and there was a continual increase every half year. West Bromwich was supplied with water from the pumping station at Wood Green.

By Mr. MUNDELL: The company did not hold themselves liable for an insufficient supply of water to the Walsall people; but witness would not submit that in any case there ever had been an insufficient supply. Some 12 months ago an accident did happen which caused an intermittent supply, but the company took every means in their power to remedy the disaster. Since then there had been a constant and good supply to the higher part of Walsall. It was impossible to give Sedgley a constant supply in the higher parts of the town. It was an extremely difficult thing to supply Sedgley at all, for, owing to the mining operations, whole streets disappeared at times. He had never been advised that the company could get more water if they enlarged their mains. On the contrary, the company had been informed by their engineer that they had reached their limits of supply. He heard complaints last year with regard to the quality of the water. That was during the hot weather, when some weed vegetation grew up in the Dudley reservoir, which was removed as soon as it was discovered. The company were not willing to supply Lower Sedgley at the South Staffordshire rate, but they desired to adhere to the rate they were allowed to charge under the Dudley Act. The reason why they charged more was because Lower Sedgley was the highest part of their district, and every drop of water consumed had to be re-pumped at great cost to the company, so that it was only fair that an extra charge should be made. At Brierley Hill they only charged the South Staffordshire rate, and he very much regretted the company had no power to charge more than they did. The company would be quite willing to reduce their rates at Sedgley to the South Staffordshire rates, provided they could get rid of the extra pumping. The company declined to agree to supply for trade purposes, except at prices which might be agreed upon. He would certainly object to supply Sedgley with water in bulk, and allow the local board to distribute it themselves. The network of pipes running through the district was so great that they really could not do so.

Re-examined by Mr. WEBSTER: At present the company did not supply the whole of the houses in their district. The company were quite willing to supply Bloxwich with water, provided they complied with the conditions of the general Act. He asked for five years time for the completion of the present works, and he thought, by the conditions of the bill, they were imposing upon themselves very heavy penalties to complete the works in that time. Considering the district they supplied with water, he thought the water-rate was extremely low.

Mr. *Henry Haseldine*, secretary to the company, examined by Mr. WEBSTER, said the capital of the company amounted to £416,000. The original intention of the company was to supply 2½ million gallons of water per day. Now the engineers reported they had gone to the limit of their supply. It was a matter of absolute necessity that they should increase their means of supply.

By Mr. MUNDELL: It was very seldom they had any complaints from Walsall as to inefficient supply. They always supplied more water on Saturday than on other days. He was certain there had been fewer complaints since 1871 than prior to it, with the exception of the period during which they were effecting repairs to one of their pumping stations, which had broken down. In Walsall they only supplied about 1200 houses, there being a very large number which they did not serve with water. The company found meters, and charged for them in accordance with the size of the meter; it averaged from 2s. 6d. to £1 per year.

Mr. *William Bawdry*, C.E., examined by Mr. WEBSTER, said he had been connected with the promoters company for eleven years. The district they served lay very high, and formed a sort of table land, falling away on both sides. The extreme height they had to come from the pumping station at Lichfield was 496 feet. There was no supply higher than the Shaver's End reservoir. The limit of their distributing power was 5 millions a day, but the engines were in the first place only intended to supply 2½ millions in the 24 hours. He was perfectly satisfied, from what he saw last summer, they could not depend on more than 5,250,000 gallons per day from Lichfield. In Walsall, Wednesbury, Tipton, and West Bromwich, there was a largely increasing demand for water, and, with projected sanitary arrangements, he had no doubt that this demand would very much increase. It could not be met, unless they went to another source of supply. By this bill they would be enabled to give a much better supply to Walsall. No damage could be done to Lord Hatherton's estate by the new works. The water would all be taken from subterranean sources. His impression was that the surface water at Huntington did not run towards Tiddesley. They would, however, be willing to supply all the persons living in the neighbourhood of Huntington who suffered from any water being taken from them by the company's new works. With regard to the proposed pumping station at Hednesford, the coal-seam lay before the water-bed, so that instead of doing any injury to the mining operations, it would be of advantage to them. There were no engineering difficulties at all in the way of carrying out the new works. They certainly would not take any water from Hednesford pond if they could help it, for at the edge of the pond there were some gas-works, and the sewage of the increasing town of Hednesford flowed into it.

By Mr. CASTLE: Mr. Burnett only got water from Hednesford pond when there was any overflow. If they really took water from Mr. Burnett's mill, then he thought the company should compensate him. He did not think that Hednesford pond was at all affected by subterranean waters, or that their proposed works would take any water from it.

By Mr. AMPHLETT: When sinking the shafts for the Cannock and Rugeley Colliery Company, so much water was discovered that recourse had to be had to tubbing. The water company's shaft would be about 400 yards from the Cannock and Rugeley shaft. No doubt their operations would withdraw a good deal of water from their mine. Supposing the water were to return to the mine in consequence of their ceasing to pump water, he did not think any injury would be done to the tubbing in the mine. The proposed reservoir at Scout House was 260 feet above the highest part of Walsall.

By Mr. MUNDELL: So far as Bloxwich was concerned, the new works would be of great advantage to them. It would also enable the company to give a much larger supply to Sedgley.

By Mr. RICHARDS: The original plan was altered, because it was understood that Lord Hatherton was opposed to the works being on his land. He believed Lord Hatherton was opposed to the whole of the company's scheme. They would take the subterranean waters for about five square miles. He had examined the Longhouse farm, and found there was not a very large supply there.

Re-examined: The water on the Longhouse farm was now taken by the Staffordshire Canal Company. It was suggested by Lord Hatherton that the company should take water from this source as an alternative scheme.

Mr. *Frank Stileman*, C.E., said he had for a considerable time been acting as consulting engineer to the water company, and he was convinced that no further supply could be expected to be obtained from Lichfield. In Cannock the population was very rapidly increasing, and it would be impossible to supply the people there from Lichfield. There was no doubt but that there was abundance of water to be obtained at Huntington and Hednesford. Taking the subterranean water would not affect the Cannock and Rugeley pits materially, neither would the water supply of Tiddesley be at all influenced by it. He had examined the estimates, which he believed to be fair and reasonable, and he thought the time allowed for completion of the works was not too long. He was satisfied that no better source of supply could be obtained.

FRIDAY, APRIL 23.

Mr. *Stileman* recalled, and cross-examined by Mr. LEIGH, said he had only examined the surface of the Cannock and Rugeley Company's property, but he was of opinion, from the nature of the ground, that the tubbing in the shafts of that colliery would not become dry if a quantity of water was taken off by the water company. It would not be necessary to pump more than 46 yards in depth for the water on Hednesford Hill.

By Mr. RICHARDS: At the Huntington Colliery he knew that there had been a good deal of trouble caused by surface and subterranean water. If this bill was passed he should, as a guess, say that the water company would not have to come to Parliament again for ten years; the new source of supply probably lasting until then. So much, however, would depend upon the increase of population and the requirements of the neighbourhood that it was impossible to form anything like an accurate estimate of the time the present supply would last.

Mr. RICHARDS: You stated in 1871 that you had power to take, from the Bourne Brook and the Lemmerley Mill stream, 10 million gallons. How is it you cannot get it now?

Witness: We have the power to take the water, but have not constructed all our works.

Mr. RICHARDS: Then you do not want water, but you want additional works?

Witness: We want both. Our original scheme was to make a reservoir at Seedy Mill, but it was found impossible to get all the water we required, in consequence of the claims of the millowners and others on the stream. Last summer Bourne Brook was almost dry, so that we could not have got any from it unless it was stored. Besides this the reservoir would have been on a low level. Last year we got no water from this stream during the dry season. One reason why the company wish to obtain a subterranean supply is that we get water at an elevation of 250 feet above the present pumping station, so that we could give Walsall the advantage of an increased pressure. In fact, without this new source of supply, it would be impossible to give high pressure at all.

The CHAIRMAN: Have you power to take water from Bourne Brook?

Witness: We have power to take the water; but no power to make a reservoir.

Mr. RICHARDS: Is not your scheme one to take Lord Hatherton's water instead of taking water from Bourne Brook and compensating the millowners?

Witness: Certainly not. So far as Lord Hatherton is concerned, he will not be affected at all by our scheme. I admit that in 1871, when giving evidence, I stated that I could get 9 million gallons of water from Bourne Brook and other

sources, and that I can now get 2½ from Hednesford, and also that I only want 10 million gallons now.

Mr. RICHARDS: Do you know there is a water company at Wolverhampton, and have you not heard that if you do not get water from Cannock they intend doing so? In short, have you not come to Parliament in order to get the water from Huntington and Hednesford before they try for it?

Witness: I am not aware of it. It is quite new to me.

By Mr. MICHAEL: Tipton would be benefited by this bill, as it would get a much larger head of water.

By Mr. CASTLE: Hednesford ponds are fed by the drainage area. Originally it used to flow towards Rugeley on the one side and Cannock on the other. He believed that the bottom of the pond was puddled. The streams in the neighbourhood came from a much higher level than that at which they proposed to take their supply, so that they would not be lowered in any way.

Re-examined by Mr. WEBSTER: If there was any chance of Hednesford pond being lowered, it would have shown itself years ago, when the mining operations commenced in that neighbourhood. Supposing they made a reservoir at Seedy Mill, they would be opposed by all the millowners in the district, and have to give a very large quantity in compensation, so that instead of getting five millions of gallons, they could only obtain four millions. That was his idea in 1871, but since then he found that the watershed had been so altered that they could not get anything like that amount of water from there. Besides that, the population was so rapidly increasing about Cannock, that the water was not pure, and would soon become unfit for consumption. The present scheme would be decidedly the cheaper. The sources of the Bourne brook were also liable to be tapped by mining operations. The new plan would enable them to supply Bloxwich with water, but under the last scheme they could not do so, and were also prevented from giving high pressure to Walsall.

Mr. *James* was recalled by Mr. WEBSTER, and put in a table of the rates charged by the company for water supply. Referring to the question of the supply from the Bourne Brook, the witness said that this source of supply had reached its fullest extent. During the drought of last year they went to considerable expense in order to get a supply, and he was certain, if that drought had continued, they would have been positively unable to meet the requirements of the district. They took as much as it was possible to take from the Bourne Brook, but thought it was not to the interest of the people that they should drink this water. The population was very rapidly increasing. Sewage was finding its way to the Bourne Brook, and some of the collieries were pumping coal water into it.

The CHAIRMAN: If you have power to take water from the Bourne, surely you can prevent pumping into it.

Witness: No; it would be impossible to prevent them.

Two or three witnesses were called to prove the demand for additional water in Dudley, Cannock, and Sedgley, and this closed the promoters case.

Mr. MUNDELL addressed the committee on behalf of the Sedgley Local Board. He submitted that his clients were being most unfairly treated by being charged at the same rate as Dudley was for water, and not put upon the same scale as was charged in South Staffordshire, especially as, in 1873, the company laid down their pipes to Brierley Hill, which was beyond Sedgley, and found it profitable to supply that place at the South Staffordshire rate. It appeared to him extraordinary that a man supplied by the same company who had, say a house at Sedgley, and another within the scope of the original scheme, should have to pay 8s. per year for water for one house, and 3s. a year for water supplied to a closet, while at Brierley Hill no charge was made either for a water-closet or house. Again, he objected to water used for sanitary purposes being charged for at the same rates as water used for trade purposes, and also to the annual charge that was made for meters without giving the consumers an opportunity of purchasing them. He was prepared to withdraw that portion of his client's petition which asked to be supplied with water in bulk, because he admitted that the local authority could not distribute it at a price which he thought the water company ought to be able to supply all the ratepayers. Another point, he thought, which ought to be granted them, was power to take water for the flushing of sewers; the price to be fixed by their lordships. He also thought that power should be given to the local authorities to erect stand-pipes for the use of the poor. The water now supplied by the company was neither pure nor constant.

Mr. *Groucutt*, chairman of the Sedgley Local Board, deposed that the supply of water to Sedgley was very indifferent. Sometimes they had been two or three days together without water. It was not pure water, for when it stood for a short time he found it was necessary to draw off a great deal before it was fit for use. He had objected to pay on one occasion, in consequence of having no water, but being afraid his supply would be cut off, he paid the money. At present he was charged 1s. 3d. per 1000 gallons for water, and 3s. per quarter for the use of the meter. Prior to 1871 he only paid 1s. per 1000. Great discontent was felt in the district at being charged more than what was called the South Staffordshire rate, and also at the impurity of the water. The rates of the South Staffordshire Company were, in his opinion, far too high, and he formed this opinion from the fact of the company supplying Brierley Hill, which was beyond Sedgley, at a lower rate than they did the latter place.

Mr. BIDDER objected to this line of examination, and

The CHAIRMAN said the promoters not having gone into the question of rates in their evidence, he thought it was a point which should be dealt with when the clauses of the bill came on for consideration.

Mr. MUNDELL said, as the promoters had raised no objection to questions of this kind being put when witnesses for the company were under examination, he ought to be allowed to go into this question now. Surely it was fair to ask his witness, as chairman of the local board, what were the requirements of his district.

The CHAIRMAN said he had no objection to that, but could not allow questions as to fixity of rate to be put.

Witness stated that there was a large quantity of water required for flushing sewers at Sedgley, and that stand-pipes should be fixed for the supply of water to the poor.

MONDAY, APRIL 26.

The CHAIRMAN said, as the question of rates did not affect the preamble of the bill, the evidence for the Sedgley Local Board should be kept to the water supply for sanitary purposes. They would have an opportunity of submitting their views with regard to the rates when the clauses came on for consideration.

Mr. MICHAEL said he should defer any remarks he had to make until the clauses came under consideration, as, on behalf of the Tipton Board, the three points he should submit would relate to the questions of pressure, fixed rates, and the supply of water for sanitary purposes.

Mr. CASTLE was then heard on behalf of Mr. Burnett, who was himself subsequently called to prove that the abstraction of water from the Hednesford pond would seriously affect his property.

Two witnesses—Mr. *Gilpin*, a millowner of Cannock, and Mr. *A. Smith*, consulting engineer, of Dudley—were heard in support of his case.

TUESDAY, APRIL 27.

Mr. *William Molyneaux*, F.R.G.S., examined by Mr. CASTLE, said he knew the Hednesford pond well, and was of opinion that it was fed by springs which rose on the east side of the valley. He was certain any pumping station placed within 140 feet of the pond would result in drying up the springs which supplied it. It would not be possible for the water company to get three million gallons a day from their shaft for any length of time.

By the COMMITTEE: It would depend entirely upon the quantity of water required, whether it would be possible for the water company to give compensation for the amount of water they took out of the pools. He was of opinion that, if the proposed shaft was sunk, after three or four years they would not be able to give any supply at all, and Hednesford pond would, in all probability, be dried up.

In cross-examination by Mr. BIDDER, witness said, assuming there was only one outlet for Hednesford pond, as alleged by the engineer of the water company, the overflow of 70,000 gallons would tend to show that the pond was not fed by springs. If the proposed shaft was sunk in three directions from Hednesford, within a mile of the pond, he would be afraid that it would soon drain it. Towards the north, however, he would not object to its being sunk within a mile, believing that at that distance no injury would be done to the pond.

Mr. BIDDER, said he was glad to be able to state that a satisfactory arrangement had been made with Walsall. With regard to the questions in dispute with Lord Hatherton, it was understood that his lordship had withdrawn all opposition to the preamble, so that the only remaining opposition was that of Cannock and the Rugeley Colliery Company, that of Lord Anglesea and Mr. Burnett. The promoters were especially desirous of meeting Lord Anglesea, as they felt it was possible his rights, as owner of the colliery, might be effected. They, therefore, agreed to these terms. In order to prevent any danger to the colliery, it was resolved to sink the proposed shaft 1½ mile to the north of the pond. That would remove Mr. Burnett's objection also. As the last witness had stated, he should not think any injury would result from the shaft being sunk at the spot they now intended to sink it.

Mr. CASTLE objected to any such arrangement being made, as he had not received any notice of it, and also that the shaft would be sunk beyond the line of deviation.

Mr. BIDDER admitted that the shaft would be sunk without the lines of deviation, and he should therefore ask their lordships to strike out that part of the 5th clause which referred to Hednesford pumping station, and should then probably have to petition Parliament to allow them to sink the shaft under a Provisional Order.

The CHAIRMAN said the committee had come to the conclusion that it was expedient to go on with the bill; but they thought a clause should be inserted protecting Mr. Burnett from any loss he might sustain from water being abstracted for the purpose of the company.

Mr. MUNDELL asked for a clause placing Sedgley and Tipton under the South Staffordshire rates. These places were now paying rates fixed under the Dudley Act of 1834, by which they had to pay 12s. a year for a water-closet, whereas in South Stafford only 4s. was paid, and 12s. a year for a lease, for which no payment was taken in South Staffordshire.

Mr. *Grainger*, house agent at Sedgley, was called. He said the rates were very unequal at Sedgley. A great deal more water was required for sanitary purposes, and they also wanted stand-pipes to be erected for the use of the poorer inhabitants. He was only aware that the Dudley rates were in force in 1873, as there had been a gradual increase in the rates ever since the company first laid down their mains. If the South Staffordshire rates were charged, he could connect another 100 houses, inhabited by poor people, with the water-mains.

Mr. *Richards*, surveyor, stated that he thought a great hardship was inflicted on Sedgley in consequence of the Dudley rates being charged. He also thought it was wrong, because at Brierley Hill, which was three miles beyond, the South Staffordshire rates were charged.

Mr. BIDDER said there were a large number of debentures issued on the security of these rates, and he thought the committee could not deal with a question involving the alteration of the rates without notice having been given to the debenture holders. All the rates now charged were fixed by Parliament, and on them these securities were held. The debenture holders were not represented here, and he hoped their lordships would not entertain the proposition now before them—of dealing with a matter in which these security holders were so deeply concerned.

The CHAIRMAN thought the case had better go on.

Mr. BIDDER said he hoped the committee would consult Lord Redesdale or some other authority before dealing with property of absent persons, without any notice having been given to them. If they would do so, he must go into the merits of the bill; but, before doing so, he must again remind the committee that their decision on this point might prove fatal to the bill itself.

In cross-examination, witness said in his opinion the works of the company were too small, the pumping power was deficient, and the mains defective. If all these things were put in order, a handsome dividend would be the result. The present works were inadequate to the supply of the district, and therefore the company could not earn a larger revenue. In some instances he thought the reservoirs were improperly placed. Now, the company had to keep on pumping night and day, and in the event of there being any break down in the machinery they could not supply the district at all. Witness thought the company wanted better works and more capital, which should be laid out prudently. In the district of the Potteries, the rates were very much lower than those charged by the promoters company. At Birmingham they were also much lower, when applied to the houses of the working classes. At Crewe, which was a town composed of nothing but small houses, the rates were considerably lower. He was sure Parliament would never grant the Dudley rates to any company now. With regard to the quality of the water supplied by the promoters, witness thought it was very good at the source, but the moment it saw daylight in such reservoirs as that at Shaver's End, it became unfit for domestic purposes. What they ought to do was to cover in all the reservoirs, as the atmosphere was far more impure than in the neighbourhood of London.

Mr. *George Waring*, clerk to the Tipton Board of Health, said great complaints had been made during the past few years as to the deficient supply of water for sanitary purposes. He objected to the Dudley rate being charged, as the mains were not laid down by the company; and because at Brierley Hill a lower rate was charged, although it was farther away than Tipton. The high rates now charged for sanitary purposes prevented the Tipton Board from using more water than they did.

In cross-examination, witness said he was aware that the charge made by the company for the supply of Tipton was not the maximum rate they could charge under the Dudley Act. He did not know that the average water-rate in Tipton was 3s. 10d. per quarter. The complaints of the price of water he had heard of were from the public generally. He had once, three years ago, written to the water company, complaining of their having increased their rates. Witness was not aware that the local board had ever complained of the cost of the water, except on one occasion, when they objected to the charge made for water supplied for water-carts.

Mr. *James*, chairman of the company, was recalled on the part of the promoters. He said that the average rate paid in Tipton for water, was 3s. 10d., and in Sedgley 3s. 4d. The debenture shares amounted to £83,000, and they were secured by the rates of the company. By the new works they would give Tipton and Sedgley an additional supply; and he did not think the company would be justified, considering the large amount they were about to lay out under this bill, in making any reduction whatever in the rate. He was not prepared to admit that the quality of the water supplied by this company was bad. When it was, it arose from purely local causes, and could be easily remedied.

WEDNESDAY, APRIL 28.

Mr. MUNDELL proposed a clause, which was accepted by the committee. It

provided that the company should not declare any dividend in excess of 6 per cent. on the ordinary share capital, nor make up any deficiency in capital, &c., "unless they reduced the rates for the water supply in the Dudley district, so as to make them in accordance with the provisions of the South Staffordshire Water Act, 1864." Another clause which provided for the supply of water at the domestic rate, in accordance with the provisions of the South Staffordshire Water Act, 1864, to the districts of Sedgley, Tipton, Dudley, and Dudley Castle, and that until this supply should be effected the rate should not exceed that now charged, was objected to by Mr. Bidder, and disallowed.

Mr. MICHAEL asked for a provision that constant pressure should be given at Tipton, and submitted a clause for the purpose; but Mr. Bidder objected, and the question was postponed.

Mr. MUNDELL said he had to bring forward an important matter affecting a large number of poor people in Sedgley. He should call a witness to prove that the continuous water supply for domestic puposes was a matter of such general requirement that it should be made of universal application. He proposed to put in the witness-box the chairman of the Sedgley Local Board, who would inform their lordships that in that locality there were a very great number of poor persons who had built their cottages on the estate of the lord of the manor. They all wanted water, and, in fact, it had been reported by the medical officer that a water supply was imperative.

Mr. *Groucutt*, chairman to the Sedgley Board, was then examined. He said there are many poor people living in Sedgley who inhabit their own houses. They are at present without any regular water supply. Altogether they number some 150 persons, a great portion of whom live within the limits of the company's mains. Probably half of them are situate within the limits of supply, the rest are from a quarter of a mile to a mile and a half from the mains of the company.

The CHAIRMAN: How do these people get any water?

Witness: They have to go to the canal, or to wells, exposed to the danger of contamination.

Mr. BIDDER opposed the claim set up on behalf on the Sedgley poor by the opponents, who wished to throw the burden on the company under the pretence of charitable considerations. It was very easy to perform a work of charity when the cost fell upon a third party. Under the general law there was every provision for the protection of people in the position of the inhabitants of Sedgley. Furthermore, it was admited by the witness (Mr. Groucutt) that half the people on behalf of whom the claim was now advanced were a mile and a half from the company's mains. It was therefore quite out of the question that they should be entitled to the advantage of the same water supply as was afforded to ratepayers within the company's jurisdiction.

After a short consultation,

The CHAIRMAN announced that the committee had decided that the clause was not necessary.

Mr. CASTLE submitted a clause for the protection of Mr. Burnett, who claimed provision for compensation for any damage arising to his property and interests on account of any interference with Hednesford pond or the springs adjacent. The clause provided that damage so caused should be compensated by reference to arbitration under the Lands Clauses Act.

The clause was adopted.

Mr. O'HARA, who appeared in the absence of Mr. Michael on behalf of the Tipton Local Board, proceeded with the postponed clause, and called

Mr. *Hipkins*, manufacturer, of Tipton, who stated that at certain times during the week he was without any water supply. This was more especially the case on Saturdays. Under present arrangements the company did not afford a continous supply. The people wanted constant pressure every day of the week. At witness's works, at Albion Street and Prince's End, there was always an insufficient supply on Saturdays, and that was a day on which water was always required for domestic purposes.

In cross-examination by Mr. BIDDER, witness said he was not aware that any complaint had been made on the subject.

Mr. BIDDER contended against the constant supply being provided by a clause. If it was really requisite the general Act would be sufficient to meet the case. It was very unadvisable to duplicate legislation by providing in a clause for what the general law had already provided. Moreover, the only witness who had been called in support of the claim had not proved anything at all, as he admitted having never made any complaint to the water company.

After a brief deliberation,

The CHAIRMAN announced that the committee were of opinion that the clause was unnecessary, the case coming within the operation of the general Act.

Mr. BIDDER said that all the opposed clauses were disposed of. Lord Hatherton's case had been met, and a clause upon which both parties were agreed would be ready by the following morning.

THURSDAY, APRIL 29.

The remaining clauses were this morning gone through and agreed to.

A clause which had been drawn up to settle the claims of Lord Hatherton was submitted and agreed to.

The bill, as amended, thereupon passed through committee.

HOUSE OF COMMONS COMMITTEE.

THURSDAY, APRIL 8.

BRADFORD WATER AND IMPROVEMENT BILL.

(*Before Mr.* ARTHUR PEEL, *Chairman; Mr.* RANDLE PLUNKETT, *Mr.* HOLMS, *and Captain* POLHILL TURNER.)

Sir EDMUND D. BECKETT, Q.C., Mr. CRIPPS, Q.C., and Mr. P. THOMPSON were counsel for the promoters; Mr. LITTLER, Q.C., and Mr. FORBES appeared for the Silsden Local Government Board: Mr. ASPINALL, Q.C., Mr. WELLS, and Mr. DIGBY for Sir Henry James Tufton, Bart.

Mr. CRIPPS opened the case for the promoters. He said the bill was a bill to enable the mayor, aldermen, and burgesses of the borough of Bradford to construct and maintain reservoirs and conduits for the storeage and supply of water, to construct and maintain gas-works, to effect public improvements, and for other purposes. He thought it was not necessary to refer the committee in detail to the preamble of the bill. They would see there a list of a great number of Acts of Parliament, all of them of recent date, which had been passed and obtained either by the Corporation of Bradford, or in some other way for the general improvement and comfort of their town, and certainly they showed a considerable amount of energy and activity. There were several matters in bills of this kind which it was desirable to include in one bill. One part of the bill related to the water supply, another to the improvement of the gas supply, another to sanitary matters, one to the construction of parks, one to some general improvements of streets, and one to give further borrowing powers. Of the different matters alluded to in the bill, and for which the corporation sought increased powers, he was glad to say there were only two matters the subjects of opposition, and which the committee would have to consider in coming to a conclusion. First of all, and probably by far the most important, was the question of the water supply, on which the bill was opposed; and he, therefore, should have to describe what had taken place, and what was the desire of the promoters more in detail than he otherwise should. The other opposition had reference to some street improvements, which the committee would find was of minor importance. These were matters entirely distinct. What he proposed to do was to follow the precedent which was commonly adopted, to keep the matters distinct, and call attention to the water question; and when they had come to a decision on that, to draw their attention to the other matter, to which the opposition was of an entirely different kind. Water was one of the improvements in which the corporation had taken a great deal of pains. In 1854 they obtained power to purchase the then existing water-works, which from time to time had been improved under Acts of Parliament. The supply of Bradford, as it then existed, consisted of a high level and a low level service. With reference to the high level, the corporation had had occasion to apply to Parliament for the purpose of making improvements in that supply, but up to the present time no application had been made for increased powers with reference to the low level service. Bradford, under circumstances of great prosperity, and the wonderful increase of population, could not possibly in 1854 have foreseen the state of things which existed in 1873 as to the necessity of the water supply. The necessity for an increased supply of water would be seen from the fact that from 66,000 in 1841 the population of Bradford had increased to 145,000 in 1871, and at the present time it was about 160,000. The low level supply was as important as the high level, because it was upon the low level that the Bradford manufacturers mainly depended for their supply. The necessity for an increased supply culminated in 1873, at which time they had very great difficulty, with all their powers, to escape a water famine at Bradford, and the necessity had gone on increasing up to the following year. So great in that year was the necessity, that the corporation found it advisable to take steps to diminish the supply of water, which was otherwise desirable, to the inhabitants. It was necessary to issue notices calling for extreme caution in the use of water. It was that necessity which he would prove in detail, and which brought the corporation here for the present bill. He would not dwell upon the inconvenience which the town would experience if that state of things continued. The question arose, in what manner this defect in the low level service could be supplied? The mode was not very difficult. Under the Act of Parliament obtained in 1854 they had power over more water than could be utilized for the supply of Bradford. Having read the Act of 1854, Mr. Cripps continued that in order to utilize the water over which they had power the construction of reservoirs was necessary to catch the water, but the Act placed a restriction upon these reservoirs, which was no doubt very proper. Parliament gave them power to take the water, but said that unless there was immediate want for the storeage of the water, they should not have power to take land as against landowners. In the year 1854 they proved their case, the quantity of water they were likely to want, and the amount of reservoir room sufficient for the wants of Bradford at the time. There was a question whether the restriction referred to both rivers Wharfe and Aire, or only to the Aire. They had power to take the water, but no power to store it. Therefore the water ran to waste during a portion of the year. The object of the present bill was not to take more water than they had now the power to take, but by reservoirs, where they had not power to place them at the present time, to store the water that was now wasted. The committee would see that that fact had a most important bearing upon the position of any opponent to this bill. There was no desire to appropriate more water. They could take now as much as they liked with their conduits, but they had no power to store it. All they asked was power to construct and maintain reservoirs and conduits for the supply of water. He impressed that upon the committee, because some of their opponents had misunderstood their object. The Aire and Calder Navigation Company was an extremely powerful body in Yorkshire, and the millowners on the Aire presented a petition against the bill. They were objected to on the ground of *locus standi*, and then they came to understand that the promoters were not interfering with the rights of others at all, nor acquiring any right to take new water, but were merely acquiring the right to take land for the purpose of storing water. Upon that being pointed out, the Aire and Calder Navigation Company, who did not generally knock under, did not contest further, but withdrew their opposition. The millowners on the Aire, also a powerful body, finding the same objection, did not think they had a case, and also withdrew their opposition to the bill. The parties who remained were the landowner, whose land they required, and the Local Board at Silsden, where the compensation reservoir was already erected, called the Silsden Reservoir. He then called the attention of the committee to the issue raised by the Silsden Board, and the answer proposed to be given to them. Originally they had the opposition of the Duke of Devonshire; but the duke having gone fully into the matter, finding the absolute necessity of water supply to Bradford, felt that the landowners interest must occasionally give way to great public necessities, and had withdrawn his opposition to the bill. The petition of the Silsden Local Board really amounted not only to a complaint against the bill, but against the provisions generally of the Public Health Act. This appeared to him to be the most unreasonable thing in the world. If Bradford refused to supply them upon fair terms, according to the judgment of the Board of Trade, they could go for water for themselves, if they should wish to tax themselves for that luxury. There were 30 other townships all supplied with water in the same way by Bradford, who did not complain of the bill. It was a monstrous thing that because Silsden had a bit of land, under which the promoters were going to put a pipe, they should think to get an advantage over all the other townships which were supplied with water. As to the case of Sir H. Tufton, he referred to the agreement entered into between the promoters and the petitioner's father, and said that, if there had been any breach of it, the petitioner had his remedy in a court of law. He asked that his estate should not again be interfered with, but he was in no different position to that of any other landowner, and private interests must give way to great necessities. It was said the reservoirs were dangerous. That was not the first time they had heard this. Mr. Ferrand some years ago called attention to this point in the House of Commons, and the consequence was, Mr. Rawlinson was sent down in 1864, and made a report on the condition of the Bradford works. He would not go into that report, as he would call Mr. Rawlinson; but it was sufficient for his purpose to say that it was favourable, and that no danger was to be anticipated from the reservoirs. The danger supposed to exist was entirely imaginary on the part of the petitioners. Further than that, by the 5th clause of the bill, the promoters undertook to make full compensation for injury caused by the water-works. He trusted that the decision of the committee would relieve Bradford from the deficiency of water, and from the apprehension of a deficiency of water, which was almost as bad for the manufacturer as the total want of it.

Alderman *Brayshaw*, examined by Mr. THOMPSON.

I am chairman of the Bradford Water-Works Committee, and have been mayor of the borough. The water supply of the corporation is divided into two systems—the high level and the low level services. The bill before the committee does not attempt to deal with the high level service. The supply from the low level service is not now sufficient. One reason of that insufficiency is the late dry season, and another reason is that there has not been sufficient room to catch the water. There is sufficient water in the district for our purpose if we had reservoir room in which we might collect it. It is to meet the want of reservoir capacity that the corporation now apply to Parliament to construct other reservoirs. The corporation are now proceeding to obtain three new reservoirs—one situate at Barden, another at Silsden, and another at Holden. The Barden reservoir is on the watershed of the river Wharfe, and the other two are on the watershed of the river Aire. I believe the Duke of Devonshire is the owner of the land about the Barden reservoir. He petitioned against the bill, but his petition has been withdrawn. The corporation are greatly indebted to him for the manner in which he acted. The millowners on the Aire have entered a petition against the bill with reference to the other two reservoirs. I believe the petition, which was signed by about 60 persons, has been withdrawn. The Aire and Calder Canal Company also petitioned against the bill, and that petition has been withdrawn. The trade of the dis-

trict round Bradford consists of various kinds of manufactures—worsted is what is considered the staple trade. The corporation are empowered to serve about 30 townships with water. During last summer there were continual applications made, because the people were short of water. Because of the short supply of water, the trains at night could not be used. There have been great difficulties, and we had to do the best we could, and put the people on short supply. We had to issue notices to the inhabitants generally, informing them of the short supply, and urging them to use great caution. The people had to be put on short allowance. At first we put the people on half supply—the valves were reduced one-half. The committee instructed the town-clerk to send letters to the manufacturers informing them of the short supply of water, and of its being reduced one-half, and asking them to be careful in the use of the quantity allowed them. That notice was issued on the 15th of July last. A resolution of the committee was sent with the letter, stating that the reduction was made in consequence of the limited water in store. We received complaints, both verbally and in writing, as to the short supply of water. There is generally a demand throughout the borough and the out-townships for more water. The corporation having obtained the services of an engineer to ascertain the best means to obtain an increased water supply, the site selected was considered the most suitable; and, according to the advice given to the corporation they have applied to Parliament.

Cross-examined by Mr. ASPINALL: One of the complaints we received was from a water-works company, to which we sell water. By the obligations entered into by agreement, we have to supply water to other places than the borough of Bradford. In every case where the out-townships have made an application to us for water we have supplied them. We are bound to supply every place that applies to us. I do not know that there is no legal obligation to supply anyone outside of Bradford—we do it. Within Bradford itself the supply is for domestic and manufacturing purposes. I cannot tell what proportion of the water supply to Bradford is used for domestic and what for manufacturing purposes. I have no idea of the proportionate quantities used. There is a very large quantity used for manufacturing purposes. I should think from about one-half to one-third, but I cannot be certain about that. The water for manufacturers use is sold by meter—at so much per 1000 gallons. The manufacturers are charged for the water on a sliding scale, the charge depending upon the quantity used—the more they use the less we charge them. The out-townships get the water by bulk at a certain price, and they sell it at any price they like to private individuals. The charge made in Bradford to manufacturers who take a small quantity is 1s. per 1000 gallons. It begins at 1s. for 1000 gallons, and goes down to as low as a little under 4d. The revenue obtained from the water to the out-townships, supplied to them by agreement, is about £5000 a year. I cannot give the quantity of water used for Bradford, and the places outside, but I can give the price obtained. We do not charge more to the out-townships than we do to Bradford; if they were taken altogether we charge them less. The out-townships have been paying 6d. per 1000 gallons for a long time, but, as it is found that will not pay, we are going to charge them 9d. when the agreement runs out, and they will have it supplied them in bulk. Silsden is now supplied with water at 6d. per 1000 gallons. When the agreement terminates, we shall charge them whatever we charge the other townships. If a person at Bradford takes a large quantity, we let him have it at 4d. per 1000 gallons. I have been chairman of the Water-Works Committee since 1866. I know Sir Henry Tufton's property very well. In point of fact, he owns nearly the whole of Silsden, and has a very large estate round the watershed. The water-works were transferred from the water-works company to the corporation in 1854. The water supply in Bradford for domestic purposes produces a great deal more than 4d. per 1000 gallons.

By Mr. LITTLER: Being morally bound to serve the out-townships, we shall have a great objection to make an exception of Silsden. We do not collect water from the natural gathering-grounds of all the out-townships. We get water from many places besides Silsden—there is Thornton, above Silsden. We supply Thornton with water. The object of the new works is to get more water, which is now greatly required, and to enable the Bradford Corporation to secure and utilize more water than they have at the present time. At present the supply of water to Silsden is obtained from Barden. It would not happen, if new works were carried out, that we should refuse to continue the supply to Silsden. We want to place all the townships on the same uniform footing by applying the same system to them all. Taking the whole of the water supplied to the large consumers at Bradford, I do not think that they are all paying as much to us as the water costs. It was considered an advantage to supply the Bradford manufacturers with water at 4d. per 1000 gallons, but we could not afford to supply Silsden at less than 9d. The income from the water-works last year was about £60,000.

Re-examined by Mr. THOMPSON: I do not know that there is any obligation by Act of Parliament on Bradford to supply Silsden, unless an agreement is made with the out-townships. The out-townships have never been refused water when they have applied to us to be supplied. Silsden and the other townships are not required to contribute to the making of the water-works, and, therefore, they are charged more for water than Bradford, which is charged for the construction of the works. By the 52nd section of the Act of 1858, we were compelled to charge not less than 1s. per 1000 gallons in respect of water used for domestic purposes in any place outside the borough. The 17th section of the Act of 1862 having repealed the 52nd section of the Act of 1858, we are at present charging Silsden 6d. per 1000 gallons, which charge will be continued up to the end of this year. After that Silsden will be treated as the other townships, and charged 9d. I should think that there are about half a dozen of the manufacturers in Bradford who do not pay more than 4d. per 1000 gallons for the water supplied to them. A great many of them pay as much as 1s. We have had a water-rate for Bradford generally—one year it was 1s., and one year it was 2s. 6d. extra. I did not know that any of the water of the district belonged to any particular person. I have always thought that all the world belonged to all the people in the world. It is generally understood that each owner on the stream using the water passes it on, having availed himself of it for the purposes for which he requires it. The old Act of Parliament requires us to charge 1s. per 1000 gallons for the out-townships. But under the new Act we sell it for 9d. The year 1874, in which we issued our notices, was a year of extraordinary drought. There had been droughts in several previous years. In 1871, 1872, and 1873 we did not get a proper supply of water at Silsden.

By the COMMITTEE: I cannot give the present storeage capacity of the reservoirs. The present prices have been charged for 10 or 12 years. It is only recently that we have found it necessary to raise the price. The area of the reservoir proposed to be erected at Silsden will be 100 acres. The quantity of water supplied varies considerably. I should say that one-third of the water is sold at the cheap rate—somewhere about 100 million gallons.

Mr. *Margerison*, examined by Mr. THOMPSON.

I am a member of the firm of Messrs. S. and L. Margerison and Co., dyers, of Bradford. Our works are large, and they are entirely dependent upon the corporation for their supply of water. The quantity of water which we consume per quarter is from 10 million to 12 million gallons. For dyeing purposes it is necessary to have a plentiful supply of water. There are about a dozen firms in Bradford who have dye-works. The supply of water by the corporation broke down last year, and our firm suffered very much in consequence. The effect of the break-down was that we could not dye the material sent to us to be dyed, and the merchants found fault with us because their goods were not properly dyed, nor delivered to them at the time they were required. The reason of both those failures on our part was due to an insufficient supply of water. We had frequently to stop our works from that cause. After we dye material we have to wash it, and for that purpose it is absolutely necessary to have a good supply of clean water. We greatly suffered on that account. Our works were stopped, for parts of the day, for days together. I really cannot say exactly the number of days they were stopped last summer. Had we had a better supply of water, we should have obtained a greater amount of work. We had during the time many applications for dyeing, and we were unable to take the work, in consequence of the want of water. We had to tell the applicants that we could not do their work, and we told them to go to other persons. The want of water, and the stoppage of the dye-works, greatly affects the manufacturers. The amount of capital that I and my partners have invested in our firm is over £30,000. I know the general feeling in Bradford as to the necessity for an increased water supply, and all those persons to whom I have spoken on the subject have said that they want more water. Last year was not the only time we suffered from a scarcity of water. I have been in business as a dyer for eight or nine years, and have suffered from want of water several times. The worst year was 1868. I believe that was worse than last year. Between the years 1868 and 1874 there have been constant stoppages of the works, caused principally from a want of a proper water supply.

Cross-examined by Mr. ASPINALL: I have not been a member of the corporation. We complain that we have lost a great deal of work because we had not sufficient water. In Bradford, when there is a short supply of water, the supply to the inhabitants is stopped some time before the supply to the manufacturers is stopped. We use the water for dyeing purposes. The quantity we use is about 1 million gallons per week.

By Mr. LITTLER: The supply of water we receive is in connexion with the low level service. We are charged on the low scale—between 3d. and 4d. per 1000 gallons. I cannot say whether it is a fact that the scale which is charged in Bradford for water used for manufacturing purposes is lower than that charged in any other place in the West Riding of York for the same purpose.

Re-examined by Mr. CRIPPS: I think the supply of water to the inhabitants could be limited, without at the same time the supply to the manufacturers being limited. I do not know whether the inhabitants could be deprived of water without the manufacturers being also deprived.

By the CHAIRMAN: The low level supply can be cut off, and the high level service remain for domestic purposes.

Mr. *Anthony Thornton*, examined by Mr. CRIPPS.

I am the superintendent of the Lancashire and Yorkshire Railway for the Bradford district. The company's stations at Mirfield and Halifax, in that district, are almost entirely dependent upon the Corporation of Bradford for the supply of water. The engines of the company have to use that water. The company are very large consumers of water—the amount that they take per quarter is something like 9 million or 10 million gallons. During the last summer our regular supply was greatly interfered with; the corporation did not provide us with the usual quantity. That was very inconvenient for the working of the traffic on the company's line. The regular supply of water began to fail about June last. We received a notice with respect to the reduced quantity which the corporation found it necessary to furnish us. At various times our engines were standing still for want of water. The traffic on the line was very seriously interfered with in consequence of the reduced quantity of water we received—the trains were frequently delayed. The passenger traffic, as well as the goods traffic, was very much deranged. We inconvenienced the goods traffic in order to afford the best accommodation we could to passengers. In consequence of the injury which the company were suffering, I personally made several representations to the corporation as to the position in which we were placed. I then was obliged to go to the general superintendent of the locomotive department and represent the matter to him. On the 22nd of July I waited again upon the corporation with reference to the supply of water. For some time after that the supply was worse than before—it went on until we got a rainfall. It is of very great importance to the safe and proper working of a railway that there should be a good supply of water; it is one of the main elements of an efficient working of a line.

Cross-examined by Mr. ASPINALL: We are supplied with water by meter. We get it from the low level service. I suppose that we pay on the low scale.

By the COMMITTEE: We suffered inconvenience from a want of water. Six years ago it was as bad then as it was last year. Since then we have suffered from the same cause, but not to the same extent.

Mr. *E. Aykroyd*, examined by Mr. THOMPSON.

I am a member of the firm of William Aykroyd and Sons, bleachers, of Bradford. Our works are large ones, and they are wholly dependent upon the corporation for the supply of water. The amount of capital which we have invested in our firm is £40,000. Our class of work is different to that which is done by Mr. Margerison; he dyes cotton previous to its being manufactured, but we bleach it after it is manufactured. In dyeing cotton, a large supply of water is required. Before, as well as during last summer, we have suffered very much from a limited supply of water. For bleaching operations we require large quantities of water, and from a want of it we have suffered considerably. We were unable to do our customary amount of work, because we had a short supply of water; and we have had great complaints from our customers. It is the general feeling in Bradford that, unless more water is obtained, the trade of the district will decrease. We were obliged to employ persons outside of Bradford to assist us in our dyeing work, in consequence of the insufficiency of water at Bradford. We employed persons at Halifax. I am sorry to say that we have lost some of our customers, because we could not do all the work which was sent us.

Cross-examined by Mr. ASPINALL: I think the short supply of water continued for two or three weeks; and during that period we could only work half time. After that our full quantity of water was restored to us. We began to work full time directly we obtained our full quantity of water again.

The CHAIRMAN: What rate do yon pay for the water?

Witness: Something under 4d. per 1000 gallons.

Mr. *Christopher Willis*, examined by Mr. CRIPPS.

I am a partner in the firm of John Willis and Son, brassfounders, of Bradford. We are proprietors of the Globe Mills. Those mills have nothing to do with brassfounding; the premises are let to tenants. We let off the rooms, and we supplied the motive power to the tenants for their work. Those mills are entirely dependent for their water supply upon the low level service of the Corporation of Bradford. There are nearly 300 hands employed in those mills, and they are engaged principally in spinning and manufacturing. We have found that the supply of water has been insufficient, and the consequence has been that we have been obliged to stop our machinery. Of course, when that takes place our workpeople are also obliged to stop. With respect to last summer, I particularly remember that the corporation were obliged to reduce the quantity of water supplied to us. What they did was to turn the valve and cut off one-half of our supply. Whenever it was necessary for the workpeople to discontinue working on account of the shortness of water, their wages stopped also. When the water was stopped for domestic purposes the people made a small riot—it was a water riot. When there was this scarcity of water, the neighbours came to us and wanted us to stop our engines, in order that they might get a better supply for domestic purposes. We did not do that until we were forced to. After that there was a still further reduction—the water was shut off for half the day. The result of that was that the workpeople had to go home. When they worked half the day, half time, of course they only got half pay. Speaking from my own knowledge, that was the result generally in

Bradford. We were obliged to employ carts to get water for us; we had from 15 to 20 carts. We had to pay 6d. per barrel for the water.

The CHAIRMAN: How much did it cost your firm?

Witness: £20 per day.

By Mr. CRIPPS: This inconvenience caused us to work at a great disadvantage. The loss of the full water supply led to further trouble—our tenants claimed for compensation and damages, on the ground that we had failed to carry out our contracts, and, as goods were thrown on their hands, they expected us to repay them for their losses. That we declined to do. I do not know whether it is the general rule that contracts for such work have to be executed by a given time. We have not yet paid the claims made against us. There still remains a considerable claim against somebody. I consider that a full, proper, and sufficient supply of water to the town is absolutely essential for the trade of Bradford and the place generally. I believe that the opinion I have just expressed is the feeling of other people at Bradford.

Cross-examined by Mr. ASPINALL: I have not the slightest idea of how much less than the usual quantity was supplied during the period that we were suffering from a scarcity.

By Mr. FORBES: In order to sink a well to get what water we require, we should have to go to a considerable expense. I believe that several dyers and bleachers, who are better situated than we are, have sunk wells on their premises in order to get what water they require.

By the COMMITTEE: It is because the water supplied by the corporation is cheap, and that sinking wells would not, therefore, pay us, that we have not sunk a well. I am not satisfied that we should get water, even supposing we were to sink a well. We should have to try first.

FRIDAY, APRIL 9.

Mr. *Charles Gott*, examined by Mr. THOMPSON.

I am a civil engineer in Bradford, and was for nearly 20 years engineer to the corporation. I am thoroughly familiar with the water supply of the district. I prepared the present scheme. In 1841 the population of Bradford was 66,715, in 1851 it was 103,778, in 1861 it was 106,218, in 1871 it was 145,827, and at present it is about 160,000. The corporation have power to supply water, not only to the town, but to about 30 townships, some very populous. Thirteen are supplied from the low level source, and these, with the lower parts of Bradford, have a total population of 205,000. The population of Silsden in 1871 was 2714. Formerly Bradford was supplied by a water-works company, and the only supply they had was about 500,000 gallons per day. That quantity was altogether insufficient for the supply of the town, and in 1852, 1853, and 1854 the corporation took steps to obtain powers to make a new scheme for themselves. The old water-works company opposed, but ultimately the corporation were authorized to purchase the whole of the undertaking, and to carry out a large scheme for the supply of the town and the surrounding neighbourhood. Since 1854 the corporation have had to apply frequently for further powers. Several Acts of Parliament have been obtained since 1854, but, so far as water is concerned, those Acts relate chiefly to the districts which are included within what are called the high level works. Bradford is a very difficult town to supply with water. It is situated at a very high elevation above the sea, the lowest land being 300 feet above the sea, and the highest land about 900 feet; so that, within the borough itself, there is more than 600 feet difference of elevation between the lowest and the highest places supplied. That is the reason why the supply has been divided into the high level and the low level services. The dividing line between the two services is about 500 feet above the sea, both supplying for manufacturing and domestic purposes. Water is supplied to the out-townships on their application. There is no compulsory power in any of the Bradford Acts to enable the corporation to compel any out-townships to take any of their water. Already arrangements have been made with more than 20 of the 30 townships which the corporation have power to supply. The price charged for the water was fixed originally at 6d. per 1000 gallons as a minimum; but, in order to have the water at that price, it was considered that the out-townships ought to take more than one million gallons a quarter. The price then rose from 6d. to 9d. per 1000 gallons, if the minimum quantity used did not exceed 600,000 gallons a quarter; so that the outlying townships could have a supply on payment of £10, £23, £27, or £30 per quarter, according to the quantity they required. During the last year that price has been altered, as the committee came to the conclusion that they could not continue to supply at the old rates. The minimum prices have been increased from 6d. to 9d., and from 9d. to 1s. The Bradford supply was first obtained from the new works about the year 1859. On the opposition of some of the gentlemen who appeared against the bill of 1858, the committee fixed the minimum price per 1000 gallons at 1s. for the out-townships, but it had been found it would be a very high minimum, and would render it almost impracticable for the outlying places to get a sufficient quantity of water for trading purposes; they therefore asked Parliament in 1862 to allow them to sell water at a less price, and the result was that the corporation were allowed to make their own arrangements as to price in the outlying places. Until the present year the price has never reached 1s., and that 1s. applies only to those places that take so small a quantity of water that they pay only between £10 and £20 a quarter for the whole supply of their towns. The increase in the price was rendered necessary by the increased cost of constructing the works. The out-townships have never contributed anything towards the original cost of the works. Whenever there is a deficiency in the income from the sale of water, a rate in aid has to be levied in order to make up the sum which has to be paid for interest on the borrowed capital, for maintenance, management, and other expenses. That rate for three years together has been as high as 1s. in the pound, but it has never been charged except upon the inhabitants of the borough. There is no power to rate the inhabitants of the outlying districts. During the last twelve years a water-rate has been levied for nine years. The highest water-rate has been 1s. during that time; but previously, I believe, it was as high as 2s.

The CHAIRMAN: Do I understand that when there was no rate the householders got their domestic water for nothing?

Witness: No; the householders paid the same price for water whether the rate in aid was levied or not.

Examination continued: The bulk of the manufacturers pay for the water by meter, the price varying from 1s. to 3½d. per 1000 gallons during the winter quarters, according to the quantity taken. For the summer quarters 20 per cent. is added to these charges. The quantity required to be taken for the minimum price of 3½d. per 1000 is 3 million gallons a quarter. The rate in aid has been laid upon manufacturers as well as householders. The high level supply is all obtained from the gathering-ground some 8 to 12 miles to the west of Bradford. The water is collected by means of reservoirs and conduits, and distributed downwards until it comes to the line below which the low level supply is given. The low level supply is all brought from works to the north of Bradford, in the valleys of the rivers Aire and Wharfe. The most distant works are on the estates of the Duke of Devonshire. The new Barden reservoir is to be about a mile from the present reservoir. The Silsden reservoir is used entirely for giving compensation water to the town of Silsden, and to the owners of property on the river Aire. The main line of conduit which skirts the low level gathering-ground collects, as it goes, all the streams which flow from the whole of the drainage area. The intercepted streams for about eight months in the year do not give more water than the conduit is able to take, but during four months of the year, when large floods are on, there is a lot of surplus water, which runs to waste, and the proposed reservoirs will enable the corporation to collect that surplus water, and hold it over until the following summer, when it can be used for the supply of the town. The Grimwith reservoir is a compensation reservoir for the owners of property on the river Wharfe. The proposed Barden reservoir is about six miles west of Bolton Abbey, in the valley of the Wharfe. We have a reservoir there which will hold about 440 million gallons. The drainage area at Barden, as it is now, is about 2600 acres; but it is proposed to have 1930 acres draining into the existing Barden reservoir, and 1570 acres draining into the proposed reservoir above. That additional supply will be obtained by means of a catchwater conduit made round the hill, so as to bring the waters from the valley, which is to the north of the Barden valley. The whole of the district around there belongs to the Duke of Devonshire. The Chelker reservoir is also in the valley of the Wharfe. No application has been made for any further compensation for the Wharfe. The corporation do not by this bill take any stream or spring in Barden which they have not got at present; but they will be enabled to hold back the surplus water in wet weather, which otherwise would run to waste. That surplus water is not used by anybody. The capacity of the proposed reservoir is 400 million gallons. The Chelker reservoir is already made, its capacity being 250 million gallons. It drains 1380 acres. No pumping is adopted at any of the water-works in the Bradford scheme. It would not be practicable to pump water, because it is a coal district. The Cringles reservoir will take water from a drainage area of 1530 acres, and its capacity will be 400 million gallons. It will not take the water from any streams except those that run either into the conduit or into the Silsden reservoir, and it will not diminish the power of compensation from the Silsden reservoir. There will be a much larger supply of water for the Silsden reservoir after these works are completed, than there ever has been before. The corporation are bound to continue to supply the specified quantity—1,350,000 gallons every 24 hours—whether it comes from the Silsden reservoir or not. If there is not sufficient water in the Silsden reservoir to give that compensation every day, the corporation are bound to make up the deficiency from their other works. There is nothing in this bill which will interfere with the water rights at all, and the corporation will be still bound to supply the same quantity. The drainage area of the Holden reservoir will be 1202 acres, and the capacity of the reservoir 400 million gallons. That reservoir will not intercept any of the streams which are not intercepted by the present conduit. The owners of the Aire and Calder Canal petitioned against this bill, but the petition has been withdrawn. Certain millowners at Silsden also petitioned against it, but that petition has been withdrawn unconditionally. With regard to the Aire and Calder Canal, the corporation had agreed to put some words into the bill which will require them to continue to give the compensation water from the Silsden reservoir, and to insert a clause that nothing in this bill shall release the corporation from their liability to give that compensation. The rateable value of property in Bradford in 1863 was £302,920, and it has gone on increasing until last year, when it was £656,068. The water income in 1863 was £17,043; and in 1874 it was £60,750. The requirements for water have overtaken the supply. In Bradford itself there has been for several years a crying want of more water. Speaking of the low level supply last year some restrictions were put on the use of water for trade, beginning on the 15th of July. For domestic purposes we made no restrictions until the 24th of July. The supply was then restricted to seven hours per day. That short supply continued until the 11th of August. The supply of the reservoirs was getting very low indeed, and the summer being scarcely half over, it was quite obvious that the full supply could not be maintained throughout the summer, and therefore some restriction on the use of water was necessary. The quantity which the manufacturers were allowed to use was limited by partially closing the valves of the services which lead from the street-mains into the several works. For domestic purposes the water was entirely shut off from the mains, except during seven hours a day. For all the large consumers there are valves put on to the services which lead from the street-mains to the works, so that the supply to any one can be shut off without interfering with the supply to anybody else. It is not possible to stop the domestic supply without stopping the manufacturers supply in the same proportion. The high level supply was worse than the low level supply. The corporation have power to make works to supplement the high level supply, but the works are not yet completed. Last year the high level supply was 112 days without water. I believe if additional reservoirs were made there would be sufficient water to fill them. If we had additional storeage room such a dearth would not occur again in Bradford for some years. There are several townships which are entitled to have a supply from Bradford, but are not yet supplied. I am not aware of any place where we interfere with the land or property of the Silsden Local Board. One or two of the conduits may have to be carried across some public footpaths or land outside the town a long way. None of the works go near to the town itself, and they do not interfere with any road or street in the town. I have not heard of any representations being made by the local board to the corporation with regard to the proposed works affecting land. At the present day works for a reservoir are made much stronger and larger than was the case 15 years ago; and as far as I know there is no feeling of danger now connected with such works. The proposed works at Silsden are sufficient to bear the quantity of water that will be contained in the reservoir. The site above Silsden is extremely favourable for the making of a reservoir. The sides of the hill come out from the valley, and form a very good spot for such works to be carried out. It is not at all an unusual thing in these valleys to place one reservoir above another. In one case we have four reservoirs one above the other in the same valley, and the same thing is common at Manchester and all large towns, as far as I know.

The COMMITTEE: In Sir Henry Tufton's petition he complains that those reservoirs will occupy the most sheltered portions of his estate, and prejudicially interfere with the lands abutting on them, as large reservoirs, placed at an elevation of from 200 to 600 feet above the sea, tend to lower the temperature and the production of the soil, as well as to render it less eligible for residences.

Witness: The land is all at a great elevation above the sea. The lowest of these reservoirs is about 800 feet above the sea, and the cultivated land above that is of no great value agriculturally. Residentially, I should think it is out of the question altogether. There are only a few small farmhouses on the land, and no one would ever think of building a residence there. The value of land there is from 10s. to 20s. an acre, perhaps not so much. It is a very bleak district. The charges that are made to Silsden are at a very low rate, between £20 and £30 per quarter for the supply of the town. The rate is 7d. or 8d. per 1000 gallons. Silsden contemplated having a supply of water for their own town for several years, but they never carried the works out until last year. Last year was the first in which they distributed a good supply throughout the township. Since that time they have been taking Bradford water. They have the benefit of the smallest charges which the corporation make. When Bradford experienced a dearth last year, no restriction was put upon the out-townships other than was put upon the supply to the town of Bradford itself. Five-sixths of the water used in Silsden during that dearth was drawn from the Barden and Chelker reservoirs. I believe the works are laid out as well as they can be. They are perhaps rather better than the other works that we have made. The estimate of expense is within the amount asked for by the bill. The total estimate of the works for water is £296,688. I have carefully examined the country all round, and I am satisfied that the sites selected are by far the best attainable.

Cross-examined by Mr. ASPINALL: We use water for public purposes—for putting out fires and for watering the streets, but we do not flush the sewers.

The inclination of the ground is such that the flow through the sewers is exceedingly rapid. The water used for fires and watering the roads is not paid for in any specific way. Whenever there is a deficiency in the water supply the watering of the roads is put an end to. We like to have a considerable reserve of water for extinguishing fires. There is pressure enough nearly all over Bradford to raise the water to the tops of the warehouses. No special expense has been incurred by that. I do not know that at Liverpool and Birmingham a water-rate is levied expressly in respect of the mains which are given to the town for extinguishing fires. I do not know that there is a water-rate of 6d. in the pound permanently imposed upon the mercantile property in Liverpool in respect of water for extinguishing fires; nor do I know that 6d. in the pound is a very unreasonable rate. There is no danger to be apprehended from reservoirs of this kind. I went with Mr. Rawlinson when he surveyed the reservoirs in 1864 or 1865. At the time of the Sheffield accident we apprehended danger from every reservoir. At Barden reservoir there was a leak beneath the embankment in 1864. The water running bright showed that it came through the strata below the puddle. A trench was opened on the inside of the puddle-wall down to the original surface of the ground, and for some distance below, so as to try and make good the defect.

Mr. ASPINALL: Was there running sand and silt found for a short distance below the level to which the drainage was carried?

Witness: There was not so much of it as to cause any portion of the trench almost immediately to collapse. This would be a cause of danger to the embankment if the reservoir was full of water, but, if the reservoir is empty, it will not. At the time you speak of the reservoir had never been filled, and it never was filled, because of its imperfection, which was discovered by the water coming right through the embankment. This has not been repaired at all. We have made the reservoir over again, in consequence of the embankment. This rebuilding cost somewhere about £100,000 probably. The power to expend that £100,000 was obtained in a subsequent Act. The substituted reservoir has only been finished within the last 12 months. The capacity of the existing compensation reservoir at Silsden is 230 million gallons. It is at a very considerable elevation above the level of the sea, and the greatest height of the embankment is 94 feet. It is not true that there was a serious collapse in the shaft alongside the puddle wall of the Silsden reservoir. The shaft had given way to a certain extent, but it never collapsed; it might be a little out of perpendicular. I am not aware that there was a leakage from the foot of the embankment. There was a leakage from the culvert.

Mr. ASPINALL: Will you undertake to say that there was not a leakage from the foot of the embankment, which the contractor attributed to a spring?

Witness: If it was a spring, it could not be a leakage.

Mr. ASPINALL: May not a spring so injure the embankment as to cause a leakage?

Witness: Some springs might.

Mr. ASPINALL: Was the water which issued from the embankment bright and uncharged with puddle and other material, which showed that it came through the puddle?

Witness: Yes, but it might have come through the masonry.

Mr. ASPINALL: Had you to drive a heading on the outside of the puddle wall, and sink a shaft for the purpose of discovering the state of things?

Witness: Not at Silsden. There was not a stream of sand and gravel found under the wall. The corporation have made a large number of reservoirs, and have sometimes had considerable difficulty in their construction. I did not make the Barden reservoir. Barden is a very difficult site for a reservoir; but they are neither of them dangerous, and never have been. Such a leakage would involve danger, if it was allowed to continue and the reservoir was kept full; but directly the corporation have found any defect in any of their reservoirs, they have taken the requisite steps to put things right. I do not know that on one occasion the people of Silsden were warned to be prepared to leave their houses in case of danger. I never heard of it until I saw it stated in your petition. The reservoirs generally are in the millstone grit and coal measures, which is as good as any kind of ground that I know of. At nearly all of our reservoirs there has been danger of such a flood as occurred at Sheffield. We had pretty nearly the same flood as they had at Sheffield, and have had heavier floods since. Nearly all these reservoirs have been in use now for 15 years, and there has not been an accident. If anything happened to the upper Silsden reservoir, it no doubt would increase the danger to the lower one. The total quantity of water in the two reservoirs at Silsden is 630 million gallons. The distance between the two is about half a mile. The town of Silsden is almost half a mile lower down. If we get this bill, there will be nothing physically to prevent our laying a pipe through our own conduit and pumping the water. If the corporation were to pump all the water out of the Silsden reservoir, it could not relieve them in any degree from having to supply the quantity which they are bound to give as compensation. We do not get any additional area by taking the water from Foster Beck. If Silsden, or Sir H. Tufton, or the two together, desire to make water-works to supply Silsden, in the event of Bradford not being able or willing to continue to supply them, they would not be entitled to take the water from any streams which are included in the Corporation Act of 1854. There are three streams in the neighbourhood that the corporation do not take. They could get a much better supply from the other streams. I cannot tell you the names of those streams now, but I shall be happy to lay out a scheme for Silsden if they want one. We are not going to make any difference in the quantity that flows through Silsden, except in the periods of floods, when it can make no difference to them. The Swartha Beck is not half a mile from Silsden, but I have never considered the subject of supplying Silsden with water. I know that the canal takes the water from the Swartha Beck. The drainage area attributable to the new Holden reservoir is 1202 acres. The area attributable to the Cringles reservoir is 1530 acres. That includes nearly all the area which was formally attributable to the Silsden reservoir. The drainage-ground belonging to the Holden reservoir is one part of the old drainage-ground. We are not getting any additional drainage area by any of our works. We propose to take water out of the Foster Beck at a spot higher up than we now do. We shall leave sufficient in the Foster Beck for agricultural and domestic use. At present the water in the Foster Beck would not be worth anything for a mill. I do not know of any mill at present on Foster Beck above the Cringles reservoir. We do not deliver the water at Bradford into the premises of people who buy it. We simply take it into the streets, and do not lay the branch into the houses; but we deliver water by meter to the out-townships, and they distribute it through the pipes. They have to incur the expense of distributing and laying the mains, so that the 6d. or 9d. which we charge per 1000 gallons to Silsden does not represent what they must charge to their inhabitants in order to repay them. They have no tank at Silsden. The expenditure there for all the pipes and everything else may possibly have been £2000. There is nothing at present to compel the corporation to supply water to Silsden unless they choose to have it. At the end of the three years agreement Bradford might stop the supply altogether. Four out of the five high level reservoirs are unfinished at present. When they are finished the high level supply will be about 3 million gallons per day. We have to supply 150,000 on the high level, and all the water we shall have will be 400 million when the works are completed. The works are not laid out at present to enable us to bring the high level water down to the low level. There would be no physical difficulty in allowing some of the high level water to run down so as to supply the low level, but works would have to be made for the purpose. In 1869 we came to Parliament for our high level bill. At that time we knew that the demand for the low level water was very much increasing, for in 1868 we found that the supply was deficient. One-half of the water in Bradford is used for sanitary and domestic purposes, and the other half for trade purposes.

Mr. ASPINALL: I believe it is the fact in Bradford that, although you are under considerable inconveniences in your site, yet, by means of your water-works, you get your water for manufacturing purposes cheaper than any other town in England?

Witness: It may be, but I do not know that it is so. Some of the other towns in England sell water for trading purposes very cheap. Before the rise in the price perhaps it was cheaper at Bradford than in any other town in England. In a town like Bradford the supply for trade is more important than the supply for domestic purposes. If the supply for trade is stopped, it stops the income of everybody depending on the trade. Silsden gets the water as cheap as Bradford, if you take into account all the risks and liabilities that Bradford incurs in addition to the price charged there. For a good many years there was no income at all from the sale of water. In flood times all the water passes in a very few hours. The embankment of the Holden reservoir will be 140 feet high. I do not know if there is any other reservoir in England with an embankment of that height, but we have some very nearly as high.

By Mr. LITTLER: The population of the whole of the water limits is about 300,000, and the population of the borough is close upon 160,000. Shipley have water-works of their own, but they have not sufficient for the whole of their demands. We take water from the natural gathering-grounds of about six out-townships. The new Silsden reservoir is to be a supply reservoir, not a compensation reservoir. At present all the water supply beyond what is required for filling the compensation reservoir, runs away, and might be collected by the local boards. If we make our new supply reservoir, there will be none to be collected, but the water that might at present be collected could not be of the slightest value to Silsden. We shall not take the water of any other stream than we do now. The seasons do not make much difference to our supply. The total supply altogether is 8,000,000 gallons a day, and that is divided over a population of 300,000. The low level supplies 6,500,000, and the high level 1,500,000. The new Silsden reservoir will contribute to the low level supply. The supply at present is about 28 or 29 gallons per head per day. That is not a very extraordinary supply. We discovered some years ago that we wanted more water for the low level. I do not know why, when we came to provide for the high level, we did not come for the low level, which I told the corporation was necessary.

Mr. LITTLER: On the present scale, do you consider you are supplying water to manufacturers in Bradford at a profit or not?

Witness: If you take them altogether we are. Those who get the water at the lowest rate, get it at something less than it costs the corporation. If you put all the items together, the outlay on the works is about £60,000 per year, or about 5d. a gallon. We supply the largest manufacturer at 3½d. a gallon in winter, and 20 per cent. above that in the summer. At Leeds and Halifax, I believe, the lowest price is 6d. Liverpool is not to be compared with Bradford, for they do not use much water there for trade. Leeds has a much better local supply than Bradford, and, therefore, the manufacturers take a less quantity. I do not think a manufacturer in Leeds taking the same number of gallons as a manufacturer in Bradford pays more for it. At the present time the cheapest rate at which we supply the local board of Silsden is 6d. per 1000 gallons, and, as soon as the agreements run out, that rate will be increased to 9d. Silsden formerly had a supply from the Holden Beck, but we bought that and paid for it. We paid the owners of property in Silsden. No doubt the overflowing water at present has a very considerable effect in flushing the beck, and clearing away any impurities there.

Re-examined by Mr. CRIPPS: The rights of Bradford and Silsden with regard to water are defined, as between one party and the other, by the Act of 1854. By that bill Silsden was made part of the district that might be supplied by Bradford. Several other out-districts were precisely in the same position as Silsden. No part of the expenses of constructing the water-works are borne by any of the out-districts, and, at the present time, all the risk which the water-works entail is borne entirely by the ratepayers of Bradford. Under those circumstances, it is only fair that the Bradford people, who spent the money and got the works, should pay a different price from those who had no part in the expense. A considerable portion of the expense of erecting these works is payable by a sinking-fund, for which the rates of Bradford are liable. There is nothing exceptional in the case of Silsden why they should have water supplied by Bradford at a different rate from the other out-districts, and they have been supplied at the same rate. Until the present bill no complaints were made, either by Silsden or any other township. Although Silsden takes water in bulk, it is not so large a consumer as some of the manufacturers in Bradford, who pay more than £1000 a year for water. If Silsden, instead of being an out-township, was a firm in the borough of Bradford, it would still pay a larger rate per gallon than the large consumers in Bradford. The greater number of the manufacturers in Bradford pay 1s.; it is only the very large manufacturers who get it at a cheaper rate. At the present time, some of the streams which we have a right to take pass over the conduit down to the beck during the season of flood. We have, at the present time, the power, if our conduit was made large enough, to intercept those streams, and take all the water to Bradford. There is no limit whatever to the size of our conduit, but we think it a better plan to intercept the water by a reservoir than by a conduit. I know what Mr. Rawlinson saw when he visited the works, as I was with him at the time he went over the reservoirs. I do not believe Mr. Rawlinson found fault in any way with the Silsden reservoir, but there were some other reservoirs at the time under construction, which Mr. Rawlinson disapproved of. Those reservoirs were not in use at the time. There is nothing in the height of the new reservoir to create additional danger. The height will increase the cost of the reservoir. The depth of water in the reservoir is to be 60 feet, the same depth as in the Barden reservoir. Where there is any unusual difficulty in the formation of the ground, we have to make a solid bottom before we can begin to make the embankment. It was the Barden reservoir in which a leak was found before the reservoir was filled. The reservoir was made in the ordinary way by a contractor. There was just sufficient water in it to show there was a leak. Silsden reservoir has been in use 15 years without any accident at all. The new reservoir will be placed in a very narrow gorge.

By the CHAIRMAN: The supply by the high level system would be about 3 million gallons a day. This increased supply has been taken into account in estimating the requirements under this bill; but that water is for a different set of places altogether. The supply for the high level parts was never sufficient. The Silsden Board have the power of fixing the price to manufacturers at Silsden. There is no manufacturer there who takes as large a quantity as at Bradford, so as to entitle him to a reduction in price. The General Act prevents local boards from entering into longer agreements than three years. Silsden has only recently taken the water at all. It was only the middle of last year that they began to take it.

By the COMMITTEE: A Bradford manufacturer taking 40,000 gallons a quarter would pay 1s. per 1000 gallons in winter, and 20 per cent. more in summer. Only the very largest manufacturers receive the water at the cheapest rate. When the high level works and those proposed by this bill are completed, the supply will be nearly double what it is at present. If a Bradford manufacturer paid the same as Silsden does, from £20 to £30 per quarter, he would be charged 6d. per 1000 gallons in winter. The rate was advanced in Bradford more than in the out-townships. The quantity supplied to Silsden is 800,000 gallons per quarter.

MONDAY, APRIL 12.

Mr. *Charles Gott* recalled, and further cross-examined by Mr. ASPINALL.

We began partly to use the Barden reservoir for the supply of water four years ago. It was filled with water for the first time in March, 1874. It then became available, to the full extent of its capacity, for the supply of Bradford.

By Mr. FORBES: The gross income from the out-townships is £5000 per annum, and the income from the sale of water for all purposes is £60,000 per annum. I do not know that it was at the instance of the Local Government Board that the township of Silsden applied to the Bradford Corporation for water, but I think it is possible.

Mr. *A. R. Binney*, examined by Mr. THOMPSON.

I am a civil engineer, now occupying the post of water engineer to the Bradford Corporation, in the place of Mr. Gott. I have had considerable experience, both in England and in India, in the construction of water-works. It was under Government that I had my experience in India. I have carefully considered the scheme for the new reservoirs which was prepared by Mr. Gott, and I have examined the sites. I consider the sites are very good, and the works are amply provided for by the estimates, and are well adapted to supply the quantity of water required for Bradford. I have seen a good deal of the works that are required for dealing with excessive rainfall, and I have actually constructed such works myself. I constructed a large reservoir at Nagpore, which is a town of 85,000 inhabitants. It is supplied by gravitation from a reservoir four miles distant from the city. The reservoir is 372 acres in extent when full, and contains 17 million gallons. In that district the whole of the water for the annual supply is afforded by the rain which falls during the months of June, July, August, and September. I have seen 3½ inches fall in 45 minutes. On another occasion I gauged the supply at 200 million gallons in three hours, and I had to design the works for impounding that water. I am acquainted with the works at Bombay. I have been consulted once or twice about them. The annual rainfall there is 76 to 77 inches, and that all falls during the rainy months, from June to September. The reservoir constructed there is very large indeed. The embankment is a very high one, and the depth of water 100 feet. It is 1260 acres in extent, and contains 3060 million gallons. The rainfall has been known to be as high as 14 inches in 24 hours. At the present time the Municipality of Bombay are constructing another reservoir immediately above that one, containing almost as much water, in the same valley. The danger of a reservoir bursting is generally to be apprehended from the floods which pass down the valley, but these floods are modified by the number of reservoirs which you place in that valley. The Cringles reservoir is the only one which is proposed to be placed above the Silsden reservoir, but in the Barden valley it is proposed to construct an upper reservoir above the existing one. There is nothing in the natural formation of the ground at the Cringles reservoir which would cause me to apprehend danger if an embankment was placed across the valley. I think it is a very favourable site for such an embankment, and the strata of the ground are very suitable. There is nothing in the height of the proposed embankment which would make me apprehensive of danger. I see many objections to the high and low level supplies being amalgamated, so that the high level may assist the low level. There is not enough water in the high level supply, even when the works now sanctioned are completed, to supply the population which are actually dependent on the high level supply. The whole of the piping throughout the town of Bradford is laid out in two separate and distinct systems. Supposing it to be feasible on other grounds, an entire rearrangement of piping would be necessary to enable the high level supply to assist the manufacturers and houses on the low level. Were it right and expedient to use the water of the high level in the low level part of the town, the pressure would be so great that I should not like to say what the cost would be for accidents. The pressure would be about 400 lbs. on the square inch. When the works are completed, the quantity of water obtainable from the high level will be about 26 gallons per head per day. It would be impossible to spare any water from the high level service to assist the low level. The corporation, under their different Acts of Parliament, have been compelled to give satisfaction to Silsden and the neighbourhood for the water which has been taken. First of all, they had to construct the Silsden reservoir, and to guarantee from that reservoir 1,350,000 gallons every 24 hours. They have also had to buy land and water rights from Sir Henry J. Tufton, to whom they paid £7000 for 30 acres of land, and all such water rights as he was willing to dispose of. The supply of water to the inhabitants of Silsden under the bill of 1854 is afforded from either Barden or Chelker. The proposed reservoirs at Cringles and Holden will not catch any water that is not already received either by the reservoir at Silsden, or by the conduit which passes from Barden to Bradford. The highest price per 1000 charged by meter to manufacturers in Bradford is 13·2d. That is taking the average of the year. There are 485 consumers which take the water at that price; 47 consumers who pay between 13·2d. and 12·1d.; 40 who pay between 12·1d. and 11d.; 65 who pay between 11d. and 9·9d.; 36 who pay between 9·9d. and 8·8d.; 16 who pay between 8·8d. and 7·7d.; 10 who pay between 7·7d. and 6·6d.; 6 who pay between 6·6d. and 5·5d.; 12 who pay between 5·5d. and 4·4d.; and 12 who pay between 4·4d. and 3·3d. At the lowest rate of all, there are 9 consumers. These charges are in addition to any rate in aid that may be made, not only on houses for domestic purposes, but also on manufactories; and there is no limit to the amount of that rate in aid, which cannot be levied on any one outside the borough, so that if something were to happen which would require the Bradford ratepayers to pay 6d. in the pound, Silsden, or any other township in which we had an agreement, would during that year get the water at the sum which was fixed by the agreement, and would not be subjected to the rates imposed on the people of Bradford. The householders in Bradford pay on the actual rent of the house. A house of £8 rental would pay 2s. 8½d. a quarter. For that 2s. 8½d. per quarter the owner could purchase at the rate of 1s. per 1000 gallons 2708 gallons, but the corporation actually supply him with 10,120, for which he actually pays 3½d. per 1000 gallons. That is the lowest class of house in the borough. A house of £30 a year would pay 12s. a quarter, and, taking the average at 5·5 in the house, they actually receive 10,120 gallons for the 12s., which is at the rate of 1s. 4¼d. For an £80 house, with one bath and one water-closet, the only charge would be £4 16s. plus 16s. for bath and water-closet. There are 14 people living in one house at that rental, and for the quarterly payment of £1 8s. they might have 28,000 gallons, or at the rate of 76 gallons per head per day, but the actual amount is 7360 gallons, and therefore the owner pays for his supply at the rate of 3s. 9¾d. per 1000 gallons. For a £120 house with two water-closets and one bath the quarter's payment is £1 19s. There are seven people in that house; the owner of that house, by purchasing his water by meter, could for the same sum receive 39,000 gallons; but taking the average of the borough, he only receives 12,880 gallons, for which he pays a little over 3s. per 1000 gallons.

Cross-examined by Mr. ASPINALL: There is a larger quantity of water consumed for domestic purposes by the rich people than by the poorer; but they pay for it at a very much higher rate than the lower classes do. I do not know the proportion of population of the very poor to the upper classes. I have no hesitation in saying that there is absolutely more water sold at the high rates than at the lower. The better class of houses have cisterns and water-closets, but in the poorer houses and cottages that is not so.

Mr. ASPINALL: Upon what principle do you charge the large manufacturer in Bradford less than the small manufacturer for water sold in the bulk?

Witness: Because he is the largest consumer. It is usual in most commercial transactions to make a deduction to a large purchaser.

Mr. ASPINALL: What is the difference between the charge to the smallest manufacturer and the charge to the largest manufacturer?

Witness: 13·2d. and 3·85d.

Mr. ASPINALL: Do you sell the water to the manufacturer at 3·85d. at a loss?

Witness: That I cannot say. According to what Mr. Gott said we should sell at a loss, but it is not a loss to the town, because the town is dependent on the large manufacturers. If the poorer population are not supplied with a large quantity of water for domestic purposes, sanitary evils will arise; but if the large manufacturers are not supplied with a large amount of water, the result is the poor people are not starved for want of water, but for want of work. I do not know that we sell to the largest manufacturers at a pecuniary loss; but if we do, that is in consideration of their supplying to the poorer population that necessary of life—labour. In the domestic supply we charge a great deal more to the richer people than to the poor people. The existing Barden reservoir is in full work now. It is one of the finest examples of modern reservoirs that I have seen.

Mr. ASPINALL: Can you give me any instance in England where there are two reservoirs of the size and importance of this in the same valley and on the same river?

Witness: Yes; at Manchester, on the river Etherow, a confluent of the Irwell. First of all there is the Woodhead reservoir, with an embankment 100 feet high; then there is a reservoir with an embankment of 90 feet, and another reservoir below that with an embankment of, I believe, 95 feet. Within the last few years they have erected two other reservoirs immediately below those three, so that there are actually five reservoirs, one below the other, in the same valley.

Mr. ASPINALL: Is there any town or village below those reservoirs upon the Etherow?

Witness: The town of Stalybridge is a few miles below. I do not know the special terms on which those reservoirs were made as between the corporation and Lord Howard of Glossop.

Cross-examination continued: The reservoirs on the Etherow are all provided with bye-washes, and there is to be one at the Cringles reservoir. The bye-wash will be on the land purchased by the corporation from Sir Henry J. Tufton. It is not mentioned in the bill, because it is not a separate and distinct work. It is part of the reservoir. The reservoir below will be much safer when the proposed Cringles reservoir is made, for one will prevent the other from being subject to those floods to which it is now exposed. The Cringles reservoir, being the highest on the stream, will be the first subject to the flood. If the Cringles reservoir burst, assuming that the Silsden reservoir was quite full at the same time, there probably would be an accident, but there is less danger of such a thing occurring when there are two reservoirs than when there is only one. In winter there is a great quantity of overflow water from the Silsden reservoir, and that would be intercepted by the Cringles reservoir, so that there would be a smaller quantity of flood water passing through Silsden.

By Mr. FORBES: There is no bye-wash to the present Silsden reservoir. The bye-wash to the Cringles reservoir is required for the flood water during the time the embankment is being constructed. It is not necessary, except during the construction of works. If I were going to construct a reservoir to-morrow, I should make a bye-wash, but simply for use during the construction of the reservoir, and not for the safety of the reservoir after it is constructed. The supply of water to Silsden is guaranteed under the Act.

Mr. FORBES: You propose by your new bill to take from them the quantity of water which at present passes down the beck; what compensation do you propose to give for that?

Witness: We purchased the right to take that water by the compensation we gave.

Mr. FORBES: You purchased the right to fill one reservoir of a particular size; now you propose to fill two reservoirs, what compensation do you propose to give?

Witness: None whatever, because Parliament has considered the question, and decided what compensation should be given to all those drainage areas, Silsden is not an opulent place. I am not aware that there is any limit at present to the charges which the Bradford Corporation may impose upon the out-townships for water. The greatest charge to any manufacturer in Bradford is 13d. I do not know what the Silsden Local Board charge to their constituents. Of course they must charge something extra for the interest on the £2000 which they have laid out.

Mr. FORBES: Therefore the water for the same class of consumers would necessarily cost more in Silsden than in Bradford?

Witness: Silsden is relieved from all the responsibility which Bradford has to bear.

Mr. FORBES: What is there to prevent Bradford charging the outlying townships for that responsibility, and so throwing it entirely upon them?

Witness: I am not aware that Bradford has a right to impose a rate on the out-townships.

Re-examined by Mr. THOMPSON: The corporation have gone to a considerable expense in improving the supply around the town by a contour main. The town of Stalybridge must inevitably be swept away if the reservoirs on the Etherow burst. In our present bill the Water-Works Clauses Act, 1863, is incorporated.

Mr. THOMPSON: By section 3 of that Act, whenever any person interested complains that a reservoir is in a dangerous state, the justices are empowered to make inquiry, and if they are satisfied that the complaint is well founded, and the danger is so imminent as not to admit of delay, they may order any person they like to enter the works and diminish the water in the reservoir?

Witness: Yes, and the clauses protecting the public are of a very stringent nature.

Re-examination continued: During the time the Silsden reservoir has been filled the largest flood known for many years has taken place, and it has stood the test. There is nothing in the construction of the proposed Cringles reservoir to make me anticipate that the justices will have to interfere. The agreements with the outlying townships are in writing, and the maximum charge is always stated in those agreements. If any accident occurred during the continuation of the agreements, we should not be able to charge the out-townships anything additional. If the Bradford people attempted to charge an unfair price to the local boards, the local boards could make water-works for themselves.

By the COMMITTEE: I consider the Silsden reservoir perfectly safe.

Mr. *Mansergh*, examined by Mr. CRIPPS.

I am a civil engineer, and have had considerable experience. The present reservoir at Barden is not large enough to utilize the whole of the water of the drainage area. The site of the proposed Barden reservoir is the best that can be had in the district, and there will be no difficulty in storing the water that it is intended to contain. At present the corporation take no water from the Silsden gathering-ground other than that which they can intercept by the conduit. They get no flood water at all. The site of the new reservoir is a very fair one, and the mode proposed for storeage is the proper mode of utilizing water. There is nothing in the construction of the reservoir which would make it in any way dangerous. There is no exceptional difficulty about it. The ground is very favourable for the construction of the Cringles reservoir. There is a very large supply in flood time in Holden. I think the reservoir there is to be placed on the only site on the stream which is adapted for a reservoir; and there is nothing at all which renders that reservoir dangerous. I believe the works can be carried out within the sum named in the estimates. The existing Silsden reservoir is the same kind of reservoir as those that are

now proposed to be made; but of course considerable experience in the making of reservoirs has been gained since that time, and they are now constructed in a better way, more safely, and more secure.

Cross-examined by Mr. ASPINALL: I am not aware that there is a considerable landslip near the proposed Holden embankment. I went there for the purpose of examining the site, and I saw nothing of the sort.

By Mr. FORBES: I do not know that the mills for which the compensation water is given are in some cases a considerable distance from the stream.

TUESDAY, APRIL 13.

Mr. *A. R. Binney* recalled, and examined by Mr. THOMPSON.

The total quantity of water sold per day for all purposes is 8 million gallons, the quantity supplied to the out-townships being 700,000 gallons. The quantity sold for trade by meter is 3 million gallons per day. In 1874 the amount received for that was £20,676 6s. 9d., the average price per 1000 gallons being 4·55d. The price charged for water supply for trade purposes has been increased since the beginning of the year 1875; so that the price, according to the present scale, would be raised to an average of 5½d. The quantity supplied for domestic use, including water for public and other purposes, is 4,300,000 gallons per day; and the amount received during 1874 was £35,046 3s. 5d., the average price per 1000 gallons being 5·37d. The total outlay on all the works to January, 1875, was £1,212,449; the total population within the limits of supply is 350,000. The average outlay per head of population is £3 10s. The population of Silsden is 2714, and that population multiplied by the outlay per head shows the proportion of total outlay, due from Silsden population is £9499. Deducting the outlay by Silsden on the pipes, as stated by their counsel, £2000, we have due from Silsden, £7499. At 4½ per cent. per annum, the proportionate outlay represents the cost to the Bradford Corporation of £337, while the annual amount received by Bradford from Silsden for the supply of water is only £120. The amount paid by Bradford to Silsden for local rates is £24 16s. 9d.

Cross-examined by Mr. ASPINALL: Silsden had its own water before the Bradford Corporation took it away, but Silsden could only construct works and supply the necessary compensation for £9500. It is a well-known fact that you can supply a large population at a less rate per head than a small population.

Re-examined by Mr. THOMPSON: If Bradford had not the high level service there would be no water at all for the out-townships, and Bradford would require all the water which comes down the conduit by the low level service, and a great deal more.

Mr. *Rawlinson*, examined by Mr. THOMPSON.

In 1864 I made a report for Government on the reservoir failure above Sheffield, and subsequently, at the request of the Home Office, I examined and reported on the several reservoirs throughout the Yorkshire and Lancashire districts. I went over the whole of the Bradford reservoirs. I think I have been over them twice or three times. The Silsden reservoir was full at the time of my visit. I examined the outlet culvert and other works, but failed to detect any leakage or other imperfection. I have inspected the plans and sections and estimates for the proposed works at Bradford, and I have no hesitation in saying that the works may be made secure with the knowledge the corporation have of what is required. It is a mere matter of expense and care. I think that expense has been taken into consideration in the preparation of the estimates. Wherever water is impounded there is a possibility of danger, whether the bank be high or low; but there is very little probability of it in this case.

Mr. THOMPSON: As to the advisability of placing one of the reservoirs above the other, is that what you have seen in many other cases?

Witness: Yes; and it is what we shall see much more frequently in the future. It is absolutely necessary, to utilize the drainage area, to make a series of reservoirs; and many of the drainage areas are very imperfectly utilized, because they have not got a series of reservoirs. It is not possible in those mountain districts to find a site where you can make one reservoir which will impound all the available water.

Mr. THOMPSON: Assuming that the works are constructed, as you say these works are proposed to be constructed, is it possible that danger will ensue from the construction of one reservoir above another?

Witness: I think not. It is entirely a question of construction; and, if proper care is exercised, there is no more danger in having one reservoir above another, than there is in having only one.

Mr. THOMPSON: Did you hear the questions that were put to Mr. Gott, as to his having acted in what you are reported to have said as "an injudicious" manner with reference to one of the reservoirs?

Witness: Yes.

Mr. THOMPSON: What reservoir was that?

Witness: The Doe Park reservoir.

Mr. THOMPSON: That is not above Silsden?

Witness: No; it is the last reservoir on the high level system. I have since seen that reservoir in repair by Mr. Gott in a most satisfactory manner. In the first instance I did find fault with the trench being cut outside the puddle without entirely emptying the reservoir, but very probably my nerves were in an extraordinary state of excitement at that time, having seen what I had seen above Sheffield.

Mr. THOMPSON: At any rate, was the result successful?

Witness: Perfectly; and I believe, as far as that embankment can be made tight, it has been perfectly tight since.

Cross-examined by Mr. ASPINALL: I did not inspect the reservoirs with any view of mastering their purpose. I simply inspected them with regard to their stability. I have no doubt you can make the proposed Barden reservoir available for the supply of Bradford, quite independently of the other reservoirs. The Doe Park reservoir was not the only one with which I found fault. I think the Barden reservoir embankment was in utter ruins. If Mr. Gott was injudicious in what he did at the Doe Park reservoir, Mr. Leather was tenfold more injudicious in what he did at Barden. I am satisfied that I did not find fault with the Silsden reservoir, otherwise I should have put it in my report. I remember saying that the Doe Park reservoir was in a dangerous state.

Mr. ASPINALL: Did you say that the millstone grit was frequently most treacherous for reservoirs?

Witness: Yes, I did; and I can tell you why I said it. The millstone grit is not *per se* necessarily dangerous, but if improperly dealt with it becomes dangerous to a degree that might not destroy the works, but would waste the water. As the natural rock is covered with alluvium, most of those valleys being valleys of denudation, if the engineer, excavating material from the inside of his reservoirs, bares the natural fissures of the rock, he may find it difficult to close it up again. Under such circumstances, it requires extreme care to prevent dangerous leaks. The mountain limestone, and some of the oolites are very difficult to deal with. The embankment to the proposed Holden reservoir will be of a very unusual height—in fact, the highest that I know of, but the reservoir itself will only be of an ordinary depth—namely, about 60 feet.

Re-examined by Mr. THOMPSON: Do you know whether that Barden reservoir was ever completed as was proposed by Mr. Leather?

Witness: I understand that Mr. Gott has completed it with a similar embankment, and I inspected the puddle of the trench for the Corporation of Bradford when Mr. Gott had got it down to the depth that he considered sufficient, and I reported it satisfactory; but I recommended that instead of putting in clay puddle in contact with the lower stratification, they should put in concrete, and I believe they did so. I believe the Cringles reservoir and the Holden reservoir are not on the millstone grit, but on the coal measures.

Mr. THOMPSON: Is that a more satisfactory formation to place reservoirs on?

Witness: There are shales in both forms. It depends upon what vein of stratification you are in. You may have just as much difficulty on the coal measures as on the millstone grit.

Mr. *Gott* recalled.

The CHAIRMAN: The committee have had evidence from Mr. Rawlinson of the state of these works in 1864, and they would wish to know whether the works have been maintained since that time in a state of efficiency?

Witness: The works have been fully maintained, and from time to time they have been repaired if any shrinkage or settlement has taken place.

The CHAIRMAN: Have any extraordinary circumstances been noticed which would affect the stability of the works?

Witness: Not at Silsden, but at some of the reservoirs the Water-Works Committee of the corporation have from time to time executed extensive works. Nothing special has been done with regard to the Holden, the Silsden, or the Barden reservoirs.

WEDNESDAY, APRIL 14.

Mr. ASPINALL addressed the committee on behalf of Sir H. Tufton, and Mr. LITTLER on behalf of the Silsden Local Board, after which the room was cleared. On the readmission of the parties,

The CHAIRMAN said that the committee had decided to pass the preamble of the bill; but they directed that a clause should be inserted in it for the protection of the out-townships, to the effect that they should not be placed in a worse position than Bradford with regard to the water supply. The committee thought that there should not be any reduction in the supply to the out-townships without a corresponding reduction being made to Bradford. The object of the clause would be to secure to the out-townships a fair and proper supply of water in time to come.

Mr. THOMPSON, on behalf of the promoters, said that they were perfectly prepared to meet the wishes of the committee.

Mr. FORBES made an application to the committee for costs on the part of the Silsden Local Government Board, which, he said, they were entitled to receive under Act of Parliament.

Mr. THOMPSON urged that the petitioners had not fulfilled the conditions required by the Legislature, which would enable the applicants to recover costs.

The room being again cleared,

The CHAIRMAN said that the committee were unanimously of opinion that the application for costs had not been sustained.

Legal Intelligence.

COURT OF CHANCERY.—THURSDAY, MAY 6.

(*Before Vice-Chancellor Sir* JAMES BACON.)

THE ATTORNEY-GENERAL AND NUNEATON BOARD OF HEALTH *v.* THE GENERAL SEWAGE AND MANURE COMPANY.

Mr. KAY, Q.C., and Mr. METHOLD appeared for the plaintiffs; Mr. H. M. JACKSON, Q.C., and Mr. COOKSON for the defendants.

The defendant company are under contract with the Nuneaton Local Board to defœcate the sewage of their district. The board filed a bill, and obtained an interim injunction restraining the company from keeping back sewage matter in the sewers so as to occasion a nuisance. The company since the injunction have pumped the sewage as it accumulated in the sewers, but they have not dealt with it all on their farms, but poured a quantity into the river Anker. The board amended their bill, and turned it into an information and bill, and asked to restrain the pumping sewage into the river, as causing a fresh nuisance. An interlocutory order was now asked for. The company resisted the injunction on the ground of necessity. They contended that as they were under injunction to remove the sewage, and could not use it all, they were obliged to pour it into the river.

The VICE-CHANCELLOR granted the injunction.

Against this injunction the defendants appealed, and the case was set down for hearing on Saturday last; but, in the absence of Lord Justice Mellish, it was adjourned until the first day of next term (May 22), on the understanding that in the meantime no application should be made to the Vacation Judge for leave to issue a sequestration against the defendants to enforce the injunctions.

YEOVIL PETTY SESSIONS.—TUESDAY, MAY 4.

(*Before Messrs.* PHELPS *and* TOMKYNS.)

ILLEGALLY TAKING WATER.

Mr. *Samuel Cross*, auctioneer, Wine Street, and *Wm. Payne*, a man in his employ, were summoned for taking water from a pipe in connexion with the borough water-works, on the premises of Mrs. Sarah Holland, Wine Street.

Mr. *Cross* said he knew nothing of the charge; he had given no directions to any one to fetch town water from Mrs. Holland's, but he was aware that the man had been sent on various occasions for several years to fetch rain water. *Payne* pleaded not guilty, and said it was rain water which he carried away. The fact of his having taken water from a tap belonging to the corporation was, however, clearly proved by two police officers.

In answer to the BENCH, Mr. *Cross* said he could say nothing more than that he knew nothing about it.

Mr. PHELPS: It is very certain you had the town water.

Mr. *Cross:* It seems so, according to their statement.

Mr. PHELPS: It is very unfortunate for you, but we have a duty to discharge. You are responsible for the acts of your servant, and you are fined £5 and costs.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Meeting of this Board on Friday last—Sir JAMES HOGG, M.P., in the chair,

Mr. NEWTON referred to the report presented on the 16th ult. by the Parliamentary Committee upon the accounts of The Gaslight and Coke Company for 1874. In moving the adoption of the report of the committee, he said: Sir, this report was presented to the board three weeks ago, and I now move that it be approved. I have no doubt the members have carefully read this report, and it is a very important one, as showing the present position of the gas question, and, as I think, completely justifying the board in the parliamentary proceedings which it has taken. I have had occasion frequently during the past year to refer to the proceedings of The Gaslight and Coke Company, and to state how ineffectually and unsatisfactorily the revising clauses of the Act of Parliament were working in the interests of the consumers. We have here the authorized document, which shows precisely the result of the year's working under the provisions of those clauses for the year 1874. You will remember that The Gaslight and Coke Company made an application to the Board of Trade to appoint a commission to revise their price, claiming 5s. 2d. as the necessary sum to enable them to discharge their ordinary obligations, and pay what they termed a statutory dividend of 10 per cent. This board objected very strongly to the imposition of 5s. 2d. as the charge for the price of gas, stating that that sum was not at all necessary. But we have always great difficulty in getting at the accounts of the gas companies to enable us to present in a succinct and forcible form before the revising commissioners the exact state of their financial affairs. Again, the companies have at their beck and call nearly the whole of the engineers, as it were—the expert witnesses who can be produced on all

occasions to support the gas companies; but it is only with the greatest difficulty that this board can obtain the assistance of gentlemen connected with the manufacture of gas to give evidence in the interests of the consumers. We found, therefore, that, although we considered ourselves to have a very good case in opposition to The Gaslight and Coke Company, we were not successful in reducing the price which they claimed of 5s. 2d. below 5 per cent. At the same time, we did put our estimate upon the papers that were issued by the commission of what would have been sufficient to have enabled the company to discharge its obligations; and it is very satisfactory to find that, notwithstanding we have not had the assistance of all the witnesses which the gas company had, nor the opportunity of examining into the whole accounts of the company, still we were much nearer the truth in our estimate than the company itself. For it turns out that although the commissioners reduced the price claimed from 5s. 2d. to 5s., the working of the year has shown that with a price of 4s. 8d. the company could have discharged the whole of their obligations in relation to the manufacture of gas, and paid 10 per cent. dividend on their ordinary share capital. Now, what has resulted from this? The company said that if 5s. was fixed as the price, they would only have the sum of about £4000 to carry over to their insurance-fund. We estimated that they would have £75,000. It turns out that they have £79,680. That is to say, the price of 5s. has enabled them to discharge all their trading obligations, to pay all their dividends upon preference shares, and their interest upon loan capital, to divide among the ordinary shareholders 10 per cent., and to leave the sum, in round numbers, of £80,000. I do not think, after this example, that I need give you another instance of the utter inutility of the commission, as no stronger evidence on the point could be adduced. Of this £80,000, £31,000 will be carried over to what is called the insurance-fund, which is equal to 1 per cent. upon the whole of the capital of the company, and £48,000 will go to the credit of the next year's account. Now let me direct your attention to a fact that occurred so far back as September last. It was then announced by The Gaslight and Coke Company that it was not their intention to go for an increase of price above 3s. 9d. in the following January. They thought, no doubt, by that means, to cut the ground from under the opposition that then existed throughout the whole of London, and to subdue the excitement that had been raised by the large increase in their price. But at the time they made that statement they had their first half-yearly accounts, which showed the large saving of £34,000 on the half year. It was plain enough, therefore, that the result of the year's operations would be to enable them to pay their 10 per cent. dividend and leave a large sum to be carried over to the next year. Now, they have carried the sum of £48,000 to this year's working, and that £48,000 is equal to 2½ per cent. upon their ordinary capital; so that they start the present year with a dividend already in hand of 2½ per cent. on their ordinary capital, leaving them only 7½ per cent. to realize during the year. The consequence is, I have no doubt, that they will absorb the whole of that £48,000 during the operations of this year, and in January next we shall have another application for a revision in their prices; because it seems quite clear that, under their present mode of working with the huge capital they have already raised, such a course will be necessary to pay the 10 per cent. dividend. You will have noticed, no doubt, one peculiar statement contained in the report of The Gaslight and Coke Company. Our accountant, Mr. Gunn, has put himself to some trouble to obtain an explanation of how this statement could possibly have been made. It was inexplicable and most difficult to understand. It is stated here: "In the award made by the commissioners for the year 1874, the price of gas fixed by them on a rental of upwards of a million sterling per annum proved, on the 31st of December to differ from their estimate of the requirements of the company made at the commencement of the year by the sum of £534 only." Now, in the face of the facts I have mentioned, that appears to be a marvellous statement. I have shown to you that they realized £79,680 more than their dividend. This report states that the result of their year's working comes out within £534 of the estimate made by the commissioners. And the explanation given of that statement, as contained in the report of your Parliamentary Committee, is this: "There is nothing in the published accounts to explain this calculation, but your committee have been given to understand that the result of a readjustment of coal contracts, arranged by the directors in the first half of the year, and alluded to in their report on the 30th of June, produced a saving to the company of £48,714. But for this saving the realized surplus of £48,180 8s. would have been turned into a deficiency of £534, so that it amounts to this, that if they had continued throughout the whole of the year to pay the same price for coal which they were paying in the month of January, when they made their claim for a revision, it would have come out within £534 of their requirements, but as the company were not compelled to pay the same price for coal throughout the whole of the year, inasmuch as by entering into new contracts they saved £48,714, they were entitled to carry that sum over to the next year's working." Now the fallacy of such a statement in the presence of that made by the commissioners themselves in their award will be patent to everyone. These are the words used by the commissioners: "Having regard to the facts that the price of coal during 1873 was considerably above the average price of the preceding period of seven years, and was continuously falling throughout the year, and to other considerations, we think that with due care and management the company would have left a larger proportion of the required coal uncontracted for, and would thereby, in the events which have happened, have saved for the consumers a considerable sum; we accordingly deduct a sum from the company's estimated outlay for coal in 1874, or, in other words, in arriving at the price of gas, we disallow that sum as the outgoing of the company. We also put on the quantity of coal left uncontracted for a somewhat lower price than that estimated by the company." You see that the commissioners reproach the company for having made improvident contracts at a time when the price of coal was exceptionally high, and for a longer period than was necessary, and they reduce their estimate, in consequence of that, to such an amount as would enable them to fix the price of gas at 5s. per 1000 cubic feet, where the company had desired to charge 5s. 2d. Notwithstanding that, in the face of that reproach, the company claim that the commissioners estimated within £534 of all that was required for the year, whilst it is shown that there was a sum of £48,000 to carry over to next year's working. There is one matter in connexion with this subject which, I think, must have arrested the attention of every member of the board. It does seem strange that the commissioners should be entitled, at a time when the price of gas was exceptionally high, and when there was a rise of 33 per cent. above the standard fixed by Parliament—that is to say, from 3s. 9d. to 5s.—to fix a price that would not only enable the company to carry on their works, and pay 10 per cent. on their ordinary capital, but such a price as would enable them to carry a sum of £31,000 to their insurance-fund during the year. I think it is against the policy of public companies that the prices existing at exceptional periods like that should be charged, which enable them to add largely to their reserve-fund. A reserve-fund or an insurance-fund is generally created in times of prosperity to provide for seasons of adversity. It is contrary to public policy that the large amount I have referred to should have been raised in a period of depression, and when prices were exceptionally high. Nevertheless, it comes out as I have stated. I do not know of anything that would more strongly confirm us in our judgment that the revision clauses of the Act of 1868 are a complete nullity. In future we ought not to rely upon them. We ought to be distinctly relieved from them, and be enabled to leave the manufacture of gas in the hands of the representatives of the proprietors of gas—I mean gas shareholders—with some degree of confidence that they will carry out their works in the best manner for the interest of all parties. The first consideration, as we might expect, would be to ensure the profits which they were entitled to under the Act of Parliament; and their next should be to supply gas at a price as low as possible, having due regard to the interests of the consumers who are their customers. But at the present time there is no inducement to lower the price of gas for the benefit of consumers. The inducement is rather to be lavish in expenditure of capital, so long as the company can always obtain a price which will secure them their 10 per cent. dividend. In the present position of affairs before Parliament, I must say that the board is peculiarly situated. We have a bill, as you know, pending in the House of Commons, and there seems to be very great difficulty in obtaining a second reading for it. I am not now referring to the merits of the bill, but to the difficulty, under the present circumstances, of obtaining a hearing for it in the House. I ought perhaps to explain that the bill is not what is technically termed a private bill. It takes rank as a public bill in Parliament. It is not entitled to go through in the same order as a private bill would be—that is, taken as the first order of the day, read *pro formâ*, and submitted to a committee for examination. Being a public bill, it has to take its chance with other public measures, and there is an order of the House of Commons that no public bill which is opposed shall be taken after half-past twelve o'clock at night. Now the gas companies are represented in Parliament by some of their own directors, such as Mr. Young and Mr. Kinnaird, and other gentlemen, and they have distinguished themselves in the House of Commons as opponents of our bill; they have put their names down in opposition to the second reading, and that retards its progress. I say that those gentlemen who represent the gas companies in the House of Commons are obstructing the bill, and making it difficult for our chairman to get it through a second reading. The state of public business now is such that it is most difficult to proceed with bills of the greatest importance, and you may see by this morning's paper that the general business of legislation has been very much retarded in the House. But the Parliamentary Committee took an opportunity on Tuesday last, before the meeting of the House in the evening of that day, to see Sir Charles Adderley on the subject, and to ascertain from him whether he could, by the aid of the Government, help the board to a night on which the merits of the bill could be discussed, and I believe that Sir Charles has been doing what he could during this week, up to last night, to get it through the second reading. On Tuesday, he told us that the Government were prepared to help us through the second reading, on condition that we would modify the sixth clause of the bill. This is that which relates to the sliding scales—that the dividends shall be dependent on the price of the gas. In talking over the degree of modification which he would require, our chairman suggested as to whether it would be satisfactory to him if the sliding scale went up as well as down; that is, the standard price being fixed at 3s. 9d., and the standard dividend being fixed at 10 per cent., the directors should be subjected to loss of dividend if they increased their price. He was asked if it would be satisfactory to them if they were entitled to a larger dividend if they could still further reduce their price; and I gathered that Sir Charles Adderley received this suggestion of the chairman with favour; and that, probably, it would be adopted. We are told this morning, for I think our chairman has received the information from Mr. Young, through Sir Charles Adderley, that the whole of the gas companies of London would be satisfied if the Regulation Bill took the basis of the legislation of 1869. Now mark, 1869; for there is a great difference between the legislation of 1868 and that of 1869. The former year, 1868, was that of the City of London Gas Bill, by which the Chartered Gas Company were compelled to supply gas of 16-candle power at a price of 3s. 9d.; but 1869 was the year of legislation on the Imperial Bill, by which the Imperial Gas Company were allowed to charge 3s. 9d. for gas of 14-candle power. The companies have expressed their willingness to take the Regulation Bill, if it would place them under the same condition as the Act of 1869. Well, I have not had an opportunity of consulting any person except the chairman, but my own opinion is that it would be simple madness on the part of this board to agree to such a suggestion. It would just amount to this: that the Chartered Company (I use the terms "Chartered Company" and "Gaslight and Coke Company" indifferently) are now bound to supply 16-candle gas for 3s. 9d., subject to a revision, and it is important to bear in mind, at this point, that their capital is more than one-third of the whole of the gas companies of the metropolis, and that they supply one-third of the metropolis with gas; but by adopting their suggestion, we should be reducing all the gas supplied to the City of London and outside the City of London by that company to 14-candle power, and we should continue the revising clauses, which would enable them to raise the price whenever they could not manufacture gas of 14-candle power for 3s. 9d. As the gas company calculate that every candle in power is equal to 2½d. in price, we should be permanently increasing the price of the gas supplied by the Chartered Company by 5d. per 1000 cubic feet, instead of giving the consumers any relief. My friend Mr. Legg, who seems to be in the secrets of the companies, said to me the other day, "Now, take my word, when you come out of the legislation of this year the companies will have got the best of you." I think this is an attempt to get the best of us in a very serious form. Nothing could be so absurd as to suppose that this board would agree to anything of the sort. The bill is before the House, and I think it must be prosecuted to the best of our ability; but, rather than admit any such regulation as that, I should infinitely prefer that there should be no legislation at all, because the companies would be in a much better position with that bill than they are in at the present time. I hope, therefore, sir, that we shall be able, if necessary, to see Sir Charles Adderley, and get from him some better conditions than these. I must say that the Government do not seem to have very strong feelings on the question in any way, for, although Sir Charles told us that he would help the bill through a second reading, there seems to be an evident desire on the part of the Government not to offend anybody. It is most difficult to get them to take a decided course. I can understand it, because I think that the present Government came into office upon the assumption that they were not to be a harassing Government, and really they do not seem to harass the gas companies very much. Our duty will be to do the best we possibly can for the consumers, in the face of the difficulties we have to contend with. With regard to the question of adopting the sliding scale above 10 per cent. as well as below, which has been viewed with favour by some parties, I must say that it is a difficult thing to deal with, from the fact that the companies have an absolute monopoly. I do not think that in any course of legislation, where there has been an absolute monopoly in the undertaking, a dividend of more than 10 per cent. has ever been recognized. For in the case of railway companies we must bear in mind that they have not an absolute monopoly. If you want to go to Manchester or Liverpool, you are not compelled to go by one particular line. There are competing lines; but with regard to gas, you cannot get it from any other company but the company which supplies the district in which you reside. So that the monopoly in gas is absolute, and it is difficult to say, with regard to an absolute monopoly, that the proprietors thereof should be entitled to go above a dividend of 10 per cent. At the same time, as a purely logical argument, it is difficult to say you should go down, because that is an incentive to good management, without also saying that you may go up, when that might be equally an incentive to good management. But I would suggest an alternative course for adoption. The gas companies say that they want a provision against periods of exceptionally high prices. They say that if the condition was that the 10 per cent. was to be secured by good management alone they would be satisfied, but they also wish to be secured against exceptionally high prices, which are matters beyond their control. I would suggest that if, by good management, they can reduce the cost price of 16-candle gas below 3s. 9d., the surplus should be accumulated in a reserve-fund until it reaches 5 per cent. of the capital, as a provision for the time of exceptionally high prices. I should prefer a scheme of that kind rather than that the com-

panies should under any circumstances be entitled to pay a dividend of more than 10 per cent. The Parliamentary Committee will have to give more consideration to this point; and it is probable that they will have to trouble the board again for some expression of opinion. I cannot leave this question without referring to the very remarkable statement that was made by the governor of The Gaslight and Coke Company, at the time he presented his report to the shareholders. I know that some members of the board have seen it and read it, but probably all have not. It was a speech which denounced, in no measured terms, the Corporation of the City of London and this board, and myself in particular, for the part I have taken at this board in relation to the gas question. Now, when gentlemen assume public positions and represent large interests, we do not expect that they will indulge in all the feelings which they may entertain; but that they will at least endeavour to conform to usages which are proper and dignified, when dealing with questions of a public nature. Least of all do we expect that a gentleman occupying the position of chairman of so great a company would indulge in vulgar vituperation, which the governor of this company did on the occasion referred to. He endeavoured to be exceedingly severe when he directed his observations to myself; but I think he only succeeded in being very scurrilous. It may not be well, however, to complain very much of this after what I have heard, and I do not wish to be severe upon him. I am informed that his temper is his great infirmity, and that he is entitled to a great deal of commiseration on that account. (After quoting the concluding sentences of the speech, Mr. Newton continued:) Mr. Beck said, in the course of his speech, that he did not expect to find the fine feelings of a gentleman in me, but he expected the manliness and honesty of an Englishman; and he says that, with reference to a letter which he wrote to me some time ago, and which he seems to say I took no further notice of than to express my satisfaction with his explanation. You will all remember that I read the letter *in extenso* at this board; it was published in the newspapers, and I directed Mr. Beck's attention to its publication, that there might be no mistake about it; so that he rather misrepresented the fact when he stated that I was content with simply expressing my satisfaction with his explanation. He thinks that I ought to have expressed regret, and he charges me inferentially with not performing my duty as a gentleman. I did not express regret, because I did not feel it; and, if not ungentlemanly, it would at least have been dishonest in me to express regret which I really did not feel. In his position as the chairman of the Chartered Gas Company, there are other interests to consider besides those of the shareholders. The Act of Parliament under which the gas companies are regulated recognizes two distinct principles—the one is that the shareholders shall be entitled to a dividend of 10 per cent., if they can fairly earn it; the other is that the consumers shall be entitled to all the profits in excess of that 10 per cent., which shall go in reduction of the price of gas. The directors of the gas companies have not only the interest of the shareholders to consider, but they should be trustees on behalf of the consumers. Then what can we say of directors who indulge in language like that in respect of public bodies whose only object is to protect the interests of the consumers? That is a question which the shareholders should seriously consider, and determine whether their interests are rendered more secure by such a mode of representation. I hope that when next we have an opportunity of reading anything from the directors of these companies, we shall find that they treat the Corporation of the City of London and this board with that respect which they are entitled to, seeing that they are only engaged in defending the interests of those who are represented by them. I hope, also, that we shall see that the proceedings in Parliament, when we get before the committee of the House, will justify everything which this board has done with a view to regulate the consumption of gas within the metropolis in the interests of the consumers.

The motion having been seconded, was put and carried.

Dr. Stevenson's report on the gas supplied by the Imperial Company to the vestry of St. Pancras, during the month of April, 1875:—Maximum light, estimated by sperm candles, according to the Act (23 & 24 Vict., c. 125)—15·2. Minimum light, sperm candles—13·6. Average light, sperm candles—14·4. Traces of ammonia, indicated by turmeric test-paper—traces only on all occasions. Traces of sulphuretted hydrogen, indicated by lead test-paper—none on any occasion. Sulphur, 15·57 grains per 100 cubic feet.

PURCHASE OF THE SOUTHAMPTON GAS-WORKS BY THE CORPORATION.

A Meeting of the Town Council of Southampton was held on the 5th inst.—the MAYOR presiding—to take into consideration the proposed purchase of the gas-works.

The Special and General Works Committee reported that at a meeting of their sub-committee with that of the Finance Committee, on the 19th of April, the town-clerk reported that he had written to Mr. Loam, gas engineer, of Nottingham, and requested him to examine and report upon the present condition of the Southampton Gas-Works, and he submitted his report as follows:—

"*Nottingham, April* 14, 1875.

"Gentlemen,—In obedience to your instructions conveyed to me by the town-clerk, I have visited Southampton, and regret to state that, although permitted to make a cursory inspection of the gas-works by the courtesy of the manager, I have not been able to do so with the sanction or authority of the chairman or directors of the company. This being so, my report must necessarily be deficient on many important points. I will, however, do the best I can with the information thus obtained, and beg, without further preface, to lay before you my observations on the plant, its producing power, and efficiency.

"The gas-works consist of—

"*Land*—Area upon which the work are placed, about 3½ acres, exclusive of wharfs.

"*Buildings consist of*—Two retort-houses, capacious coal-sheds in connexion with above, engine-house, purifying-house, meter-house, various workshops, gasholder-tanks, tar and water tanks, and general offices.

"*Plant*—Total number of retorts, 268; condensing, scrubbing, and washing apparatus, three steam-engines, four purifiers (20 feet square each), one station-meter, three large gasholders in excellent condition (the small gasholders are comparatively useless). The length of mains in the borough is returned at about 40 miles; it is thought the length outside the borough will not exceed 25 miles, thus making a total of 65 miles. Public lamps in the borough are 820; those beyond I have no means of ascertaining.

"*Manufacturing Capacity*—The maximum producing power of 268 retorts is equal to nearly 1 million cubic feet of gas per day. I estimate each mouthpiece to average about 4000 cubic feet in 24 hours—thus, new retort-house, 128 retorts at 4500 cubic feet each per day, equal 576,000 cubic feet; old retort-house, 140 retorts at 3000 cubic feet each per day, equal 420,000 cubic feet; total daily manufacture, 996,000 cubic feet.

"*Storeage*—The contents of the two large gasholders are equal to about 680,000 cubic feet. I have excluded the capacity of the old gasholders in consequence of their small dimensions and defective condition. I was informed that the largest annual consumption of gas is about 160 million cubic feet, and the quantity of coal used annually is about 20,000 tons, thus showing the producing power of the works to be largely in excess of the demand. Assuming the annual make of gas to be 160 million cubic feet, the average daily make would be 438,356 cubic feet, showing the capacity of the works to be more than double the present demand. I consider the access to and egress from the works to be very favourable; the river on the one part and the railway on the other render the communication with the premises most convenient and important. In conclusion, I beg to observe that, so far as my limited inspection of the gas-works is concerned, I am favourably impressed with the excellence of the more recent portions of the establishment, and although the older section is that in the most efficient condition, still, taken as a whole, the works are in a very fair state of efficiency. I am of opinion that the property would be a most valuable acquisition to the borough of Southampton.

(Signed) M. H. LOAM.

[Appended to the report was a table showing the approximate sum paid on the transfer of gas-works to local authorities in several towns—see JOURNAL OF GAS LIGHTING, vol. xxiv., page 758.]

The above report having been read and considered, the committee resolved that in their opinion it was satisfactory.

At the same meeting the town-clerk reported that he had had an interview with the principal cashier of the Bank of England in reference to the terms upon which the Bank would be disposed to lend the corporation about £300,000 upon the security of the Southampton Gas Purchase Act and the general district rates for a term of three, five, or ten years, and submitted a correspondence which had passed upon the subject. He also read a letter from Mr. C. C. Smith, secretary to the gas company, dated April 7, 1875, stating that if the corporation would give £14,000 per annum in perpetual annuities in addition to the borrowed capital and compensation to the officials for vested interests, the directors would submit to the proprietary whether they would accept annuities in lieu of 25 years purchase-money on their maximum statutory dividends. The committee, having fully considered the matter, were of opinion—1. That they would not be justified in recommending the council to pay the gas shareholders £14,000 per annum in perpetual annuities. 2. The committee are strongly impressed with the expediency of the shareholders agreeing to an arrangement for accepting annuities as proposed in the town-clerk's letter to Mr. C. C. Smith of April 3, 1875, but that instead of the annuities being perpetual the corporation should redeem the whole upon the basis of 24 years purchase within the maximum term to be stipulated in the Act. 3. To pay the shareholders not more than 24 years purchase upon the maximum statutory dividends, as proposed in Mr. Smith's letter of the 3rd of February last. 4. In either case the corporation to take over the mortgage debt. 5. In either case the back dividends to be secured or paid less the contingent-fund. 6. In either case the corporation to make an allowance for vested interests. 7. It was further resolved that the mayor be requested to wait upon the directors of the gas company and negotiate upon the foregoing terms, and this he subsequently did. At a further meeting of the committees the town-clerk submitted a letter from Mr. Hammond Chubb, secretary of the Bank of England, stating that the court of directors had had under consideration the application for a loan of £300,000 at 4½ per cent., and that they were willing to grant the loan at that rate of interest, for five years, with permission to repay it within that period in sums of not less than £5000 at a time, subject to a report by Messrs. Freshfield's, the Bank's solicitors, upon the security, and a satisfactory arrangement as to the period when the advance would be required. At the same meeting a letter was read from Mr. C. C. Smith, dated April 26, 1875, forwarding a copy of a resolution passed by the directors of the gas company, as follows, viz.:—"That the directors are willing that the transfer of the undertaking should take place on the 30th of June next, provided that the purchase-money be then paid, the profits up to that date to belong to the company. If the purchase-money be not paid on the 30th of June, the corporation to pay interest at the rate of 4 per cent. per annum on the whole amount of the purchase-money until the completion of the business, the profits of the company, after the 30th of June, in that case to be paid to the corporation. The amount of compensation to be made for the vested interests of the officials to be £5250." At the same meeting the town-clerk submitted the particulars of rent-charges, annuities, and contracts payable by the gas company, and which he had received from Mr. C. C. Smith. An approximate balance-sheeet of the gas-works purchase was submitted, showing a profit of £853 0s. 8d. for one year, as also the draft agreement for the sale and purchase (subject to the approval of Parliament) of the gas company's undertaking; and a report drawn up by the sub-committee was unanimously adopted. It was to the effect that preliminary arrangements had been made with the directors of the gas-works for the purchase of the company's interests therein at 24 years purchase upon their statutory dividends, amounting to £244,800; also to pay the arrears of dividend, less the contingent-fund, and to compensate the directors, auditors, and secretary. In consultation, Mr. Michael, barrister-at-law, the counsel retained on behalf of the Corporation of Southampton, one of the first authorities on all matters connected with gas and water, strongly recommended the sub-committee to accept the offer of the gas company, as he considered the corporation would have a good bargain. This opinion was given after a full examination of the accounts of the company, and a consideration of the facts bearing thereon. Mr. Michael was a good financier, which was very unusual with gentlemen of the long robe. They were also influenced by the evidence obtained from the late contest between the Corporation of Birmingham and the outlying districts as to their gas-works purchase bills; and Mr. Loam, whom they had consulted, was of opinion that they had made much better terms than Nottingham, for Nottingham started with an annual loss, whereas Southampton would start with a profit which must increase year by year. The bill had been redrawn, and powers were sought to extend the payment of the moneys borrowed to 100 years, which would reduce the sinking-fund to a very small amount. Power was taken in the bill to issue debentures, the object being to obtain money in small sums at 4 per cent. redeemable at six months notice. The only point of difference between the committee and the directors was the compensation to their secretary; he claimed £3000 as compensation, his salary being £350 per annum. Whilst the committee were prepared to deal liberally with that gentleman they could not recommend the payment of such a large sum, and would prefer to take his services, leaving the matter of compensation open for future arrangement.

The MAYOR moved the adoption of the report, and, in the course of his speech, read the balance-sheet referred to by the committee, which was as following:—

Liabilities.

Capital—purchase	£244,800	0	0
Arrears of dividend	10,500	0	0
Compensation to directors	2,000	0	0
Auditors	150	0	0
	£257,450	0	0
Less contingent-fund (say)	5,600	0	0
	£252,450	0	0
Interest on £252,450 at 4½ per cent.	£10,729	2	6
Interest on loan at 4½ per cent. (which will be paid off)	1,345	11	0
Interest on the expenses of the mortgage transfer and the Act, say £4000, at 4½ per cent.	170	0	0
Compensation to secretary, 4½ per cent. on £1400	63	15	0
Renewal-fund, amounting in 30 years to £16,825	300	0	0
Sinking-fund, to pay off the whole of the debt, £289,610 in 75 years	637	3	0
Balance, being profits per annum, without any credit for increase receipts	853	0	8
	£14,098	12	2

Assets.

Profits for the year 1872	£12,629	15	5
Do. do. 1873	13,043	0	9
Do. do. 1874	9,394	11	8
	3)35,067	7	10
	£11,689	2	7
Saving on the interest of loan	1,519	9	7
Directors and auditors	540	0	0
The secretary	350	0	0
Estimated increase in the profits per annum not credited	—		
	£14,098	12	2

Mr. GAMLEN seconded the motion.

A long discussion followed, in the course of which an amendment to adjourn the meeting for a week was made, and subsequently withdrawn.

The motion was at length put and carried, 17 voting for it, and 14 against it.

HULL GAS SUPPLY.—Mr. Baynes reports that the illuminating power of the gas sent into the district of Sculcoates and Myton by the British Gas Company during April was good; free ammonia and sulphuretted hydrogen were at no time present to the ordinary tests. The results for the month are—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	17·09	15·99	16 34
Grains of sulphur per 100 cubic feet. . .	36 00	28 £0	32 10

Mean barometer and temperature in experiment-room:—Bar., 30·13; tem. 59°.

Mr. James Baynes, jun., also reports that the gas supplied to the east district by the Sutton Southcoates and Drypool Gas Company was of satisfactory illuminating power. It was free from sulphuretted hydrogen, and the sulphur compounds were low.

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·24	15 82	16·06
Grains of sulphur per 100 cubic feet. . .	⌐	—	13·76

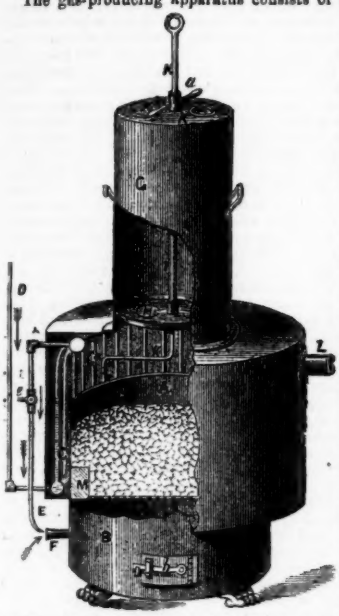
Mean barometer and temperature in experiment-room:—Bar., 30·07; tem. 54°.

A NEW HEATING GAS.

KIDD AND BARFF'S PATENT.

The members of the Iron and Steel Institute (whose meeting was held in London last week) were invited to Stafford House, St. James's, on Wednesday, to an exhibition of Kidd and Barff's apparatus for making peat charcoal, and for producing gas from the charcoal. The peat-charring apparatus, a model of which was shown on the occasion, is at work on the estate of his Grace the Duke of Sutherland at Alt-na-Goule, and also at some works at Crowle, near Doncaster. In carrying out the invention, the turf is simply cut by hand from the bog and partially air-dried, after which it is thrown into trucks, and run into ovens, where it is partially or entirely charred as required. It is then drawn out of the ovens into chambers, and rapidly cooled in contact with the waste gases and steam escaping from the ovens.

The gas-producing apparatus consists of a cylindrical vessel, A, in which the peat charcoal is placed, and above this is a tubular steam generator, C. This generator is a simple coil of iron pipe surrounding a furnace, into which the water is brought, under pressure, by the pipe D, from an elevated cistern. The steam thus generated becomes superheated by having to travel through a large portion of the coil. In this state it is conveyed into the closed ash-pit, B, through the steam-jet, E. The escaping force of the steam from this jet forces air into the ash-pit through pipe F. The charcoal fuel is fed into the generator by the hopper, G, which is controlled by sliding covers, H H, moved by arms, *a a*, through the fuel inlet, *K'*. The gas outlet, L, at the top of the generator, is contracted, and as air is driven by the escaping force of the jet of superheated steam into the ash-pit, a pressure is created under, above, and between the particles of fuel, the radiation or absorption of heat from the bottom of the fuel being prevented, so that the combustion at that point, where a high temperature is important, is intensified, thus causing the process of decomposition to become much more rapid, and allowing of a much larger volume of steam being decomposed into hydrogen and carbonic oxide.



The inventors claim for this new method of producing heating gas that, as compared with gas produced by the distillation of coal in retorts, the cost will be only 1-16th, taking coal gas at about 4s. per 1000 cubic feet. An analysis of the gas by Mr. T. W. Keates gives the following:—

Carbonic oxide	28·6
Hydrogen	14·6
Nitrogen	53·0
Carbonic acid	4·0
	100·2

With respect to the question of the quantity of gas that may be produced by a given quantity of carbon, treated in the manner proposed by the inventors, Mr. Keates make the following statement:—"In round numbers, let it be said that 1 lb. (7000 grains) of carbon would produce 28 cubic feet of carbonic oxide, 14 cubic feet of hydrogen, and 4 cubic feet of carbonic acid. In that case, a ton (2240 lbs.) of carbon would produce about 63,000 cubic feet of carbonic oxide, and 31,300 cubic feet of hydrogen—together 94,300 cubic feet of combustible gas, such as that which was the subject of my report. The carbon of the carbonic acid may also, I think, be partially made to produce carbonic oxide, and not carbonic acid. I should say that one-half, at least, may be utilized in that way; then there must be added to the above 94,300 cubic feet of gas a further 4000 or 5000 cubic feet of carbonic oxide, making together nearly 100,000 cubic feet of combustible gas produced by one ton of carbon. . . . . Adding the volume of combustible gas to the volume of nitrogen united therewith, more than 200,000 cubic feet of mixed gas would be obtained in treating one ton of carbon according to Mr. Kidd's method." The gas may be carburetted, and burnt as illuminating gas.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Business is still quiet in the finished iron trade of this district, though the tone is slightly improved, and makers are hopeful in the prospect of a better demand. Makers of best bars report themselves much better off, and state that they are now able to keep their mills in full production; there is, likewise, a more spirited inquiry for sheets and boiler plates, quotations for best iron are consequently firm on the basis of £10 10s. for bars, though it is still evident that buyers are only placing the more pressing specifications, and are yet looking for a reduction in prices at no distant date.

Quotations for the commoner qualities of iron are very irregular, in consequence of the keen competition for the few orders at present in the market, and many transactions are this week reported on the standard of £8 10s. for bars, which is 5s. per ton below the rates ruling a fortnight ago.

Galvanized roofing sheets continue in exceptionally good request, and makers are unable to complete deliveries as promptly as required.

Much interest has been manifested this week in the conference of ironmasters and ironworkers opened in London on Tuesday last to further discuss the wages question. The negotiations, so far, appear to have given general satisfaction, and no anxiety is felt as to the ultimate issue, the general conviction being that an amicable settlement of the question will easily be obtained.

The pig iron market is still languid, though preparations are in progress for relighting additional blast-furnaces in several parts of the district, in view of an improved demand which, it is expected, the opening of the Northern shipping ports will shortly induce. Quotations are still £3 to £3 5s. per ton for cinder pig, £5 for hot blast, and £6 for cold blast native all-mine.

Foundry iron is in good request, the ironfounders as a rule being well employed. Gas and water pipes are in prominent inquiry, and, in many cases, makers are pressed for delivery.

At Wednesbury, the wrought tube and fitting trades are still depressed, and without prospect of improvement.

The coal trade is very flat, fuel being now freely offered; prices are weaker, except for best qualities. The associated masters appear to prefer the contingency of a dull trade to such a reduction in price as is necessary to stimulate a healthy demand.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

I have again to report a quiet state of affairs in connexion with the local iron trade, there having been hardly any movement worth noticing during the week.

Pig iron has remained in tolerably good request, but there has been a slight weakness in the quotations for general makers brands, in sympathy with the quiet tone of the Scotch market. The following are average quotations for North York pig iron:—No. 1 foundry, 63s. to 63s. 6d.; No. 2 foundry, 59s. to 60s.; No. 3 foundry, 57s. to 57s. 6d.; No. 4 foundry, 55s. to 56s.; No. 4 forge, grey, 55s. to 55s. 6d.; No. 5 forge, mottled, 54s. to 54s. 6d.; No. 6 forge, white, 52s. to 52s. 6d.; refined metal, 74s. to 75s.; Kentledge, 65s.; and cinder pig, 43s., all per ton for net cash. South Yorkshire and North Derbyshire forge pig is about 62s. 6d., whilst a good foundry quality is readily obtainable at 72s. per ton. No great quantity of local make is, however, at any time disposed of in the open market, consequently it is not easy to arrive at a precise estimate of its current value.

Merchant iron is in very limited request, with the exception of a few leading Yorkshire and Derbyshire brands—such as Bowling, Low Moor, and Butterley—although the prices at which the lower and medium qualities are offered are put down to the lowest possible medium.

The foundries are quite as well engaged as when last reported upon, and the brassworkers have still a steady amount of work on hand and in their books.

Coal continues to decline in price, and is gradually meeting with a slacker demand. At many of the collieries, long ranges of coke-ovens have been, or are being erected for the purpose of making coke from the slack coal; three tons of slack, worth say 2s. 6d. per ton, being all that is required to make a ton of coke worth 17s. or 18s. Steam and gas coal are unchanged in price, but there have been reductions during the week in most other classes of fuel.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

In the Manchester market there is a moderate amount of business doing, but the general demand is much quieter. The demand for house coal has fallen off very considerably, and engine and forge coal are in less request, although the best qualities are still pretty readily disposed of, and the stocks at the pits have not yet accumulated to any large extent. Although there have been no list reductions in the Manchester market, the lower prices in the outside districts and the underselling amongst the smaller concerns have caused a weaker tone even amongst the leading firms, who are finding it necessary in some cases to make concessions for large sales. There is, however, a strong feeling against any movement in the list rates, which would have to be accompanied by a reduction in wages, until the colliery proprietors have accumulated some stocks.

In the large coal-producing districts of West Lancashire trade is very quiet, and prices are easier, although there have been no reductions beyond the lowest prices accepted last month. There are a greater number of sellers at the low rates which had previously been conceded by only a few of the colliery proprietors. Stocks are being put down in many cases, and some of the colliery proprietors have decided to put their pits on short time.

The shipping trade is exceedingly dull, and there is very little doing either coastwise or foreign. Prices are very weak, good steam coal delivered alongside being readily bought at 12s. 6d. per ton, and inferior classes at about 11s. 6d. per ton.

There are still a good many inquiries in the market for cannel, and the price of this class of coal is without much change. There is a very fair inquiry for gas coal, but, beyond the orders which I mentioned in a previous report, there is not very much actual business doing, consumers who are in a position to keep back being rather inclined to withhold their tenders in anticipation of lower prices. Good cannel at the pit mouth in the Manchester district is quoted at 20s. to 22s. per ton, and Wigan cannel at from 27s. 6d. to 30s. per ton; good screened gas coal 13s. to 14s., and unscreened 12s. to 13s. per ton. These, however, are the full prices, and concessions are obtainable for good contracts.

There is no very material alteration in the coke trade; business is rather quiet, but prices are about the same as those last quoted.

There are no signs of any improvement in the iron trade of this district, and founders and manufacturers are still complaining very much of the smallness of orders. Prices are weaker, and for absolute orders purchasers can obtain concessions, although there is no alteration in the list quotations, which are the same as those given last week. In finished iron there is very little change, but for large orders some makers are disposed to accept low rates. Ordinary bars delivered are nominally quoted at £8 12s. 6d. per ton delivered, and other descriptions of manufactured iron in proportion.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England is not quite so firm as it was a fortnight ago, though it is moderately steady. The strong rally which was expected to take place, in connexion with the coal trade to the Baltic, has not occurred, and the Baltic merchants are either procuring coals from other districts—which is probable—or they are "bearing" the market. At any rate, Baltic orders are, to a considerable extent, kept out of the coal market of the North of England, and business thence is quiet. There is not very much doing for France at present, and the exportation of coals to the Mediterranean has fallen off somewhat. It cannot be said either that there is any great activity in the coasting trade. Under these circumstances, though prices are tolerably well maintained at late quotations, shipping turns for coals are short—say, from four to five days.

During the last week the general course of business in the freight market tended to lower rates. Not more than £9 per keel was paid to France, and £8 per keel to the English ports of the British Channel. Baltic freights to Cronstadt were about £8 per keel, and there was a fall of about 10s. per keel upon freighting to the Mediterranean.

The Cleveland iron trade is only quiet. There was another great failure last week in the district, which had a very disturbing effect upon business. Some small wages disputes of a disagreeable character are likewise beginning to crop up in the iron trade again.

The coke trade of the North of England keeps extremely firm. Prices have a hardening tendency, and there is a continued good demand from the iron trade and for shipment.

The general manufacturing trade of the district is fairly good. The shipments of metal pipes, fire-bricks, machinery, manufactured iron, and chemicals to the Continent is active, with a fair prospect of a steady business. Men are falling into good work, but, whilst the manufacturing trade of the North of England is steady, there is no speculative business of any description, and upon the trade which is doing there is only a narrow margin of profits.

The water question was again before the Newcastle Town Council on Wednesday, but, after some talk, the council was tolerably well convinced that, all things being equal, there is a good supply of water stored for the summer months. This observation applies to all the other Tyneside towns, which got a "scare" through the drought of last summer.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas question was again up for consideration at the meeting of the Helensburgh Town Council on Saturday, the 1st of May, the circumstances which brought it up being a request from the new gas company for permission to lay down pipes. On the motion of Provost Steven it was resolved—"That the Town Council give any sanction within their power to the new gas company to open the streets and lay pipes, subject always to the supervision of the superintendent of streets, or other party appointed by the Town Council, and subject to the provisions of the local Act, and under the distinct condition that the Articles of Association of the company to sell the works to the Town Council and Police Commissioners, if required, within five years from the date at which they commence to supply gas, at cost price of works, with 5 per cent. interest thereon, less any dividends received; and also that they undertake not to amalgamate with the existing gas company." After some discussion, ex-Provost Porenigan, as a proprietor of the existing gas company, said that the old company were willing to turn over their works to the council when a suitable price could be agreed upon. He did not deny that they wanted 10 per cent., but he could say that it was their wish to give the best gas at the cheapest price.

At a meeting of the directors of the Helensburgh Gas Company, held the same day, it was resolved to take off 1s. 3d. instead of 10d. (formerly proposed) from the price of the gas per 1000 cubic feet. A prospect was held out that a further reduction might shortly be expected. The directors have evidently been stimulated very much by the action of the new company. They have asked for offers, to be immediately returned, to supply gas and splint coal and shale during the ensuing year. The prospectus of the new company has now been in circulation for about a week, and the feeling on the question of gas supply now runs very high in the town, which, by the way, is fast becoming one of very considerable importance.

An extraordinary general meeting of the proprietors of the Inverness Gas and Water Company is to be held next Saturday, for the purpose of considering the bill now before Parliament for the sale and transfer of the company's undertaking to the Police Commissioners of the burgh of Inverness. It is not expected that there will be any opposition, the sale and transfer being a sort of "foregone conclusion," in which case the proceedings will be merely formal.

At the last meeting of the Dundee Water Commission reports were submitted regarding the progress of the new water-works, and it was resolved that there should be a public celebration of the opening, a committee being appointed to co-operate with the Dundee Harbour Board with a view to having the celebration on the same day as that appointed for the opening of the Victoria Dock. The average daily consumption of the water last month was 3,322,268 gallons, being an increase of 126,364 gallons on the average for the previous month.

The Hamilton Water-Works Extension Bill now before Parliament has passed the Commons unopposed, those persons who threatened to give opposition having been amicably arranged with by the promoters of the bill.

On the suggestion of a committee who had visited the Helensburgh, Dumbarton, and Paisley Water-Works, the Police Commissioners of Gourock have resolved to construct a new reservoir, which is likely to cost from £500 to £550.

At their last monthly meeting the Dumfries Water Commissioners took into serious consideration the subject of an increased water supply, and a report from Mr. Gale, engineer to the Glasgow Corporation Water Commissioners, was read. It recommended that the present pipe between the works and the loch should be lowered 5 feet for some distance from the loch. The report was adopted, and it was remitted to the Works Committee to request Mr. Gale to visit Dumfries as early as possible, and to prepare specifications for the work to be done, and on obtaining these, the committee were instructed to advertise for contracts, and lay the same before the next meeting of the commission for consideration. A movement is in progress for the purpose of having a water supply district formed for Branderburgh and Elgin. Two or three meetings have been held in connexion with the matter, and at the last one, Provost Cameron, as chairman of the Harbour Company, suggested that before actually adopting the proposal, certain inquiries should first be instituted as to the place where water could be obtained, the probable expense and rate of assessment, as also the conditions on which a loan could be obtained from the Public Loan Commissioners. The meeting approved of the suggestion, and appointed a committee to make the necessary inquiries and to report to another meeting of the local authority. The well-known village of Ellon, Aberdeenshire, has just had an excellent supply of water turned on. The works are designed for giving a supply of upwards of 25 gallons per head per day throughout the water supply district.

The pig iron market has been quiet and flat during most of the past week. Prices have fallen as low as 66s. and 66s. 3d. for warrants, and several of the makers have reduced the price of special brands 1s. or 2s. all round.

In the coal trade there is no improvement to report. Prices in the West of Scotland have certainly not fallen any further, or only to a very small extent. In Fifeshire there is a sort of favourable condition, and prices are somewhat steady.

AIR GASLIGHT COMPANY, LIMITED.—A petition for the winding-up of the above-named company has been presented to the Court of Chancery by Mr. Charles Weightman Harrison (the patentee of the processes adopted by the company), and Mr. Charles Edwin Harrison, trading under the firm of Harrison and Sons, creditors and contributors of the company, and the petition is appointed to be heard before Vice-Chancellor Hall on the 28th inst.

INSTITUTION OF CIVIL ENGINEERS.—At the meeting of this society on Tuesday, the 4th of May, 1875—Mr. Thos. E. Harrison, president, in the chair—it was announced that the council, acting under the provisions of the bye-laws, had transferred Messrs. Harry Edward Jones, engineer to the Ratcliff Gas Company, and George Carless Trewby, engineer to the Chartered Gas Company, from the class of associates to that of members. The monthly ballot resulted in the election of 37 candidates, amongst whom Mr. Robert Paulson Spice, Westminster, was elected a member, and Messrs. John Burgess, Huddersfield; Charles John Chubb, Bedford Row; Charles Alfred Craven, engineer and manager of the Dewsbury Corporation Gas-Works; Thomas Milnes Favell, engineer to the North Shields Water-Works; William Andrew M'Intosh Valon, engineer and manager to the Isle of Thanet Gas Company; and James Watson, engineer and manager to the Dundee Water Commission, were elected associates.

HAVERFORDWEST PUBLIC LIGHTING.—A deputation, headed by Lord Kensington, M.P., had an interview with Mr. Sclater-Booth, at the Local Government Board Office, on the 30th ult., for the purpose of calling the attention of the right honourable gentleman to a difficulty which had arisen in administering the provisions of an Act passed in 1835, dealing with the paving, lighting, and improving of the town of Haverfordwest, and the adjoining towns of Prendergast and Cartlett. The deputation pointed out that, under the Local Act of 1835, commissioners were appointed to carry out its provisions, and that this course had been followed up to the present time. The Local Government Acts of 1872 and 1874 had, however, taken away the powers of the commissioners with regard to paving and sewers, leaving simply the power to make and supply coke, and counsel had advised that they were unable to make a rate under the local Act simply for lighting purposes, inasmuch as the Act gave only power to make the rate for the general purposes contemplated in the provisions. They were, therefore, anxious that a clause should be introduced into the Public Health Bill now before Parliament, so that the remaining powers of the commissioners might be transferred to the Town Council as the urban authority. They presumed there would be no difficulty as to this, because the Public Health Bill granted to urban authorities the power to purchase the works of gas companies. The president, in reply, said that he would do the best he could to further the views of the deputation; but he was afraid that, if they began to insert clauses to meet the particular case of particular localities, they would be lead away from what they originally intended.

MANCHESTER (CORPORATION) GAS SUPPLY.—At the meeting of the Manchester City Council on Wednesday last, Mr. Bennett said as about three-quarters of the financial year had now elapsed he wished to ask a question with regard to the financial position of the Gas Committee, and on the answer he received would depend whether he would give notice of his intention of raising the question again at the next monthly meeting. Some statement should be submitted showing what was the real position of the Gas Committee in regard to its profits. His object was not to embarrass the committee, but to help them out of a position in which they ought not to be—that was, paying out of their capital profits which they had not made. Mr. Bright asked for an explanation as to the difference of illuminating power between the gas coming from Rochdale Road works and that coming from the Gaythorn works which was said to exist. Alderman Lamb said the committee had not been able to make 10 per cent. profit and to pay their debts, and that was the reason they had been obliged to advance £53,000 to the Improvement Committee. They were expecting to have a profit, and it was not owing to the bad management of the committee—perhaps it was owing to the bad management of the council, who were always interfering with the committee—that that profit had not been made. There was no fund in hand at present to pay off the debt. With regard to the alleged difference in the illuminating power of the gas from Rochdale Road works and Gaythorn works, 18 or 20 candle gas was considered the best, and the instructions of the committee were that the gas from both these works should be 19-candle gas. A long discussion ensued upon the following motion proposed by Alderman Murray:—"That inasmuch as instructions have been given to Dr. Roscoe to prepare a report as to the influence of the gas-works proposed to be erected near the Philips Park and Cemetery, upon vegetation generally, and the public parks in particular, the Gas Committee be instructed not to take any steps for the carrying out of the resolution adopted at the last meeting of the council in relation to the proposed new gas-works until the report had been received and placed before the council." In the course of the discussion, a correspondence was read, in which it appeared that the instruction to report upon the question had been sent to Professor Roscoe by the Parks and Cemetery Committee, which had passed a resolution disapproving of the proposed site, and that Professor Roscoe, in view of the discussion of the question in the council, and the result arrived at at last meeting, had not at present taken any measures towards preparing his report until he should receive further authority to do so. An amendment was moved by Alderman Hopkinson approving the site, and declaring that a professional report on its eligibility was not required. On a division, this amendment was carried by 28 to 22.

PAINT AS AN ENGINEERING MATERIAL.—At a meeting of the Society of Engineers, held on Monday evening, May 3, in the Society's Hall, Westminster Chambers, Victoria Street—Mr. J. H. Adams, president, in the chair—a paper by Mr. Ernest Spon, on "The Use of Paint as an Engineering Material," was read. The author, in the first place, considered the necessity for the use of paint, and then noticed the composition and characteristics of the pigments usually employed by engineers. White lead, he observed, should be of good quality and unmixed with substances which may impair its brightness. It is usually adulterated with chalk, sulphate of lead, and sulphate of baryta, the last being the least objectionable. Zinc white is not so objectionable as white lead, but is dry under the brush, and takes longer in drying. Red lead is durable, and dries well; but should chemical action commence, it blisters, and is reduced to the metallic condition. Antimony vermilion was suggested by the author as a substitute for red lead, and its qualities enlarged upon. Black paints from the residual products of coal and shale oil manufacture, and oxide of iron paints, are generally used for ironwork, for which purpose they are peculiarly suited. Allusion was also made to anti-corrosive paints, and to those containing silica. Referring to the oils used in painting, the author stated that linseed oil was by far the most important, and that its characteristics deserved careful study. It improves greatly by age, and ought to be kept at least six months after it has been expressed before being used. It may be made a drier by simply boiling, or by the addition of certain foreign substances. Nut oil and poppy oil are far inferior in strength, tenacity, and drying qualities to linseed oil. The author noticed the driers employed, and alluded to the properties and means of testing the purity of spirits of turpentine. He then dwelt at length upon the mixing and practical application of paint to new and old woodwork, the preservation of cast iron by means of Dr. Smith's pitch bath, and the cleansing, painting, and care of wrought-iron structures. He stated that when used under proper supervision no better protection could be found for iron structures than oxide of iron paints. He concluded by observing that the real value of any paint depended entirely upon the quality of the oil, the quality and composition of the pigment, and the care bestowed on the manufacture; and that the superiority of most esteemed paints was due to these causes rather than to any unknown process or material employed in their preparation.

ANOTHER TESTIMONIAL TO MR. STELFOX.—On the evening of the 3rd inst., the officials and workmen connected with the Belfast Corporation Gas-Works met in the dining-room adjoining the works, for the purpose of reading an address and making a presentation to Mr. James Stelfox, on the occasion of his resigning the office of manager, as an expression of their thanks for the great interest he always took in their welfare. The spacious compartment was appropriately decorated for the occasion. The company included the wives and female friends of the officials and workmen, and there were also present a number of strangers. Tea and its accompaniments having been partaken of, the chair was taken by Mr. A. Turnbull, the cashier, who in a very able speech referred to the long services of Mr. Stelfox. In the course of his remarks he said that for "the last twenty years the town of Belfast has been increasing rapidly in its trade and population, and, to meet an ever-increasing supply of gas, continual additions required to be made to the gas-works, involving a large amount of labour and anxiety to the manager. The buildings, machinery, and gasholders which were in use in the year 1852, when Mr. Stelfox came to Belfast, have all long since disappeared and in their places we have new and large buildings, new and improved machinery, and large gasholders, that will compare favourably with any similar concern in the three kingdoms. To give some idea of the increase that has taken place, I may just state that in the year 1872 the gas made was 87 millions of cubic feet, and in the present year the make will not be less than 420 millions of cubic feet, or nearly five times the quantity. So that while the town has been extended on every side, the gas-works have been increasing with it, until it is now a large and, I will add, a prosperous concern. I regret that Mr. Stelfox should have found it necessary to retire from the services of the corporation, and the large attendance here this evening of workmen and officials shows that you share this feeling. But, while I thus express regret that our official connexion with Mr. Stelfox has ceased, it is satisfaction to us all that he is succeeded in the management by his son, James Stelfox, who has been brought up in our midst, and whom we all respect. I think the corporation have been fortunate in securing his services, and I hope and expect that he will prove a worthy successor to his honoured and respected father, and that the same harmony and good feeling which has existed between his father and the officers and workmen will be maintained under his management." The testimonial consisted of a very handsome tea urn, coffee tray, marble dining-room clock and obelisk, with suitable inscriptions; also a beautifully illuminated address, in which the kind feelings of the officers and men towards Mr. Stelfox were expressed in most appropriate terms. A very pleasant evening seems to have been passed on the occasion.

Register of New Patents.

2711.—ELSE, G. E., Horsforth, Yorks, "*Improvements in valves or cocks.*" Patent dated Aug. 5, 1874.

In these improvements the valve or cock is provided with a plate, by which the passage way is closed, sliding in vertical guides. The plate being adjustable by a screwed stem, is made to ascend into a chamber in the shell or casing of the valve or cock to open the passage way of same.

2717.—HASELTINE, G., Southampton Buildings, London, "*An improved method of and apparatus for effecting the illumination of steam and water gauges, and for other like purposes.*" A communication. Provisional protection only obtained. Dated Aug. 5, 1874.

The object of this invention is to apply the luminous effect of the transmission of electricity through rarefied gases to the illumination of gauges, and to other similar purposes; and consists in combining with the object to be illuminated a transparent tube that has been partially exhausted, and in the opposite ends of which are hermetically sealed the ends of the metallic conductors from an induction coil and battery.

2742.—PATTON, W., Wandsworth, Surrey, "*Improvements in valves for controlling the delivery of water or other liquids from or into pipes, cisterns, tanks, or other vessels or apparatus.*" Patent dated Aug. 7, 1874.

This invention relates to valves, which are chiefly designed for automatically governing the delivery of water from water-pipes or passages into cisterns or other receptacles for household purposes. This valve is also applicable for arresting or permitting the flow of liquids in pipes or passages for any other purpose, being constructed so that it is kept closed by the pressure of the water contained in the pipe or passage to which it is applied till such times as the pressure so acting upon it is removed; the valve is then free to open fully and permit water to pass freely through it, till the pressure is again brought to act upon it to close it.

The valve is constructed as follows:—A socket or box is screwed upon or otherwise attached to the water supply-pipe. The socket has an aperture communicating with the supply-pipe, which aperture is covered when the valve is closed by a flexible diaphragm of india-rubber or other suitable material. Surrounding the aperture in the socket is a flange, and the diaphragm is enclosed and secured between this flange and a cover, whose inner side is recessed and forms a chamber or space wherein the diaphragm can work freely. In the flange is formed a passage or passages, through which the water passing through the aperture in the socket when the valve is open may freely escape into the cistern or other receptacle. In the diaphragm is a small hole, or a passage is made through the socket and flange in such a way as to form a communication between the supply-pipe on one side of the diaphragm and the chamber in the cover on the other side of it, in order that the water in the supply-pipe may have access to the chamber. In any convenient part of the cover of the diaphragm, or attached to it by a pipe or passage, a small perforated nipple is placed. This forms the seat of a small disc or other suitable valve fixed on the end of a lever, or working in a guide, and operated by a lever working on a fulcrum in such a way as to cause the small disc-valve to open or close the passage through the perforated nipple, for the purpose of allowing the water in the chamber above the diaphragm to escape or to be confined within it.

To the end of the lever a ball or float is attached, and the automatic action of the valve is as follows:—When the level of the water in the cistern or other receptacles rises, the ball or float rises with it, and causes the lever to press the small disc-valve upon its seat, and so close the passage through the nipple. The chamber above the diaphragm is then closed, and the water confined within it attains a pressure equal to that of the water in the supply-pipe, and the diaphragm, being subject to such pressure on a greater area in the chamber than the area of the aperture in the supply-pipe, made by such pressure to close securely the aperture, and so prevent the further flow of water from the valve. When the level of the water in the cistern or other receptacle falls, the converse of this takes place, as the ball or float falling with the water, the lever causes the small disc-valve to open the passage through the nipple. The water in the chamber above the diaphragm is then permitted to escape from it as fast as water is supplied to the chamber through the communication between it and the supply-pipe. The pressure of the water in the chamber is then reduced to less than the pressure of the water in the supply-pipe, and the diaphragm is free to rise and allow the water to pass from the supply-pipe into the cistern or other receptacle till such time as the level of the water has again risen and closed the valve. When the pressure of the water in the supply-pipe is not very great, the small disc-valve may be operated directly by the ball or float, without the intervention of a lever.

When the valve is not required to work automatically, there is substituted for the small disc-valve and nipple and the lever and ball or float, any suitable tap or other means for closing and opening the passage from the chamber above the diaphragm; and in some cases a cylinder containing a suitably packed piston of larger area than the area of the aperture communicating with the supply-pipe, is substituted for this diaphragm and flange.

If desired, the arrangement of the supply and outlet passages may be the reverse of those described.

2797.—JONES, F. St. J., Worcester, "*Improvements in taps and valves for regulating the flow of gas and other fluids.*" Provisional protection only obtained. Dated Aug. 13, 1874.

This invention consists in forming a lock-tap or valve, more especially applicable to gas-fittings, but which may be applied for regulating the flow of other fluids.

The lock-tap consists of the usual plug or valve, having a square pin, by preference formed at the smaller end of the plug; and on the square pin is fitted the handle, having a suitable hole passing through it for that purpose. The end of the square pin is made round to receive a helical spring, the lower portion of the hole through the handle being also rounded, so that the spring is encased in the handle, and the parts are made secure by a nut or washer screwed or rivetted upon the end of the square pin. The spring is for the purpose of keeping the handle pressed against the body of the tap or valve, which is formed flat upon its under side, and has a groove or slot cut across, into which fit corresponding lugs or projections, formed upon a collar or rim of the handle, the groove or slot and lugs constituting the locking parts.

When the lugs or projections are up in position in the grooves or slot, the tap or valve is turned off. To turn it on, the handle is first pulled from the body sufficiently to clear the lugs or projections from the groove or slot; and the handle being then turned, either right or left, for a quarter revolution, the tap or valve will be full on, and when turned again either way a quarter revolution the tap will be off, the lugs or projections springing into place in the groove or slot by the action of the spring. The spring also tends to draw the plug farther into its seat in the body of the seat, therefore the tap is kept constantly air-tight, and the parts are relieved in wear. The plug should be formed with considerable taper in the direction of its length, to prevent it binding in its seat in the body.

2802.—HENRY, M., Fleet Street, London, "*Improvements in the method of and apparatus for obtaining ammonia from waste products and other matters.*" A communication. Patent dated Aug. 3, 1874.

This invention is especially applicable for treating waste products, the refuse heat and deposits being utilized and offensive smells removed. The apparatus consists of pumps, heaters, and separating vessels combined with the distilling column into which the liquid whence the ammonia is to be extracted is driven, after passing through tubular heaters heated by the freed liquid from the distilling column. Steam and lime white are introduced into the distilling column, the liquid from which passes into a separator fitted with an internal tube, at the bottom of which the deposits are left; the ammoniacal vapours pass into the sulphuric acid vessels through tubes heated by steam-pipes. To prevent offensive vapours, the gases are carried under the generator furnace. The pumps are regulated so as to feed the liquid and lime white in proper portions.

2815.—SMITH, W. H., Edgbaston, Birmingham, "*Improvements in treating metals and their alloys by subjecting them to the action of liquids, gases, vapours, and in apparatus employed therein, and for the manufacture of gas for illuminating and heating purposes.*" Patent dated Aug. 15, 1874.

In this invention wood-naphtha, hydrocarbon, hydrochloric acid, nitrous acid, and iodine in a fluid state, and the gases and vapours resulting from any or all of the above liquid matters, carburetted hydrogen or coal gas, nitrogen gas, and atmospheric air, in such proportions as may be required, combined or uncombined, are used. Each of these fluids is placed in a separate vessel or chamber; the contents of these respective chambers are conducted together or separately into a passage through which a current of atmospheric air, gas, or vapour is caused to flow, so that the air, gas, or vapour, alone or combined with any or all of the liquids, gases, or vapours, may be conducted in any required proportions to the cupolas, furnace, converter, or other suitable vessel containing the metal or metals to be acted upon, or to a receiver or gasometer for further use or when required for illuminating and heating purposes. The principle adopted and the apparatus used for effecting the above are the same as, or similar to, that well known for making ether sprays or other air-spray jets.

The gases or vapours as described in patent No. 610, dated the 18th of February, 1874, may be used and applied to operate in like manner on the metals above mentioned and their alloys.

2822.—FORBES, Rev. G. H., Broughton, Northampton, "*Improvements in the manufacture of cement.*" Provisional protection only obtained. Dated Aug. 15, 1874.

This invention is an improvement upon patent No. 2374, July 7, 1874. According to the former invention, coke or its equivalent is intimately combined with chalk and clay, with or without tar, for the purpose of manufacturing cement. According to this invention coke or coke breeze, or an equivalent of the same, or coal or coal dust, is intimately combined with chalk or limestone or quicklime, with or without tar, for the like object.

2824.—JOHNSON, S. H., Stratford, Essex, "*Improvements in cocks or valves.*" Patent dated Aug. 15, 1874.

The improved cock consists of a tube through which the fluid passes, stopped with an internal diaphragm, at each side of which in the tube are ports or passages through which the fluid can pass from the interior to the exterior of the tube. Upon the tube, and concentric therewith, is a cylindrical sliding jacket or casing, packed at each end so as to prevent the passage of the fluid between the ends of the cylindrical casing and the tube.

2850.—LUDEKE, J. E. F., Camden Town, London, "*Improvements in machinery or apparatus for obtaining and applying motive power, and in turbines and pumps applicable thereto, parts of which improvements are applicable to raising water and other liquids or fluids, and to other useful purposes.*" Patent dated Aug. 19, 1874.

According to this invention the centrifugal pump is applied to a reservoir of water in which its vertical tube rotates in pivoted bearings, its horizontal arms being surrounded by a turbine whose axis is in the same line as, but independent of, that of the pump; the water raised and ejected by the pump against the turbine falls into a circular chamber enclosing both, and is conducted to an overshot water-wheel, or other motor, for the supply of surplus power and other purposes.

The turbine gives its power back to the pump by aid of band and pulley gearing, and the overshot wheel may be similarly connected to the pump.

The turbine is formed by an annular plate with a flanged border, in which recesses or apertures are cut to conduct the liquid by radial ducts to a central discharge. Or the turbines may be dispensed with, and an inverted conical cylinder may be substituted as a fixture on standards, the water being ejected and elevated over its edges to an external channel, and then to a water-wheel or other motor; or the cylinder may be true, and provided with internal curvilinear tubes or channels for conducting the water.

APPLICATIONS FOR LETTERS PATENT.

1599.—JENNINGS, J. G., Lambeth, and POCOCK, A. W., Westminster, "Improvements in liquid-meters." April 30, 1875.

1619.—HAIGH, B., Cubitt Town, London, "Improvements in water-closets." May 1, 1875.

1621.—HAIGH, B., Cubitt Town, London, "Improvements in cocks or valves." May 1, 1875.

1625.—PAPE, T., Nottingham, "Filtering and deodorizing sewage so as to prevent rivers being polluted thereby." May 3, 1875.

1626.—RHAMES, R. W., Wicklow, "Improvements in gas-burners." May 3, 1875.

1642.—LOMAX, G. H., Massachusetts, U.S.A., "Improvements in lamps." May 3, 1875."

1655.—CAPPALL, R. M., Fleet Street, London, "Improvements in apparatus for containing compressed or liquefied gases for the speedy extinguishing of fires, inflation of life-saving appliances, and other useful purposes." May 4, 1875.

1662.—BUCHAN, W. P., Glasgow, "Improvements in water-closets." May 4, 1875.

1672.—WHITLEY, J., Leeds, "Improved mode of and arrangements for removing from sewers and dealing with deleterious gases." May 5, 1875.

1692.—CREASY, J. T., Lambeth, and TULLY, W., North Bow, London, "An improved apparatus or machine for utilizing the pressure of water, air, gas, or other fluid as motive power." May 6, 1875.

1693.—POPOFF, M. A., St. Petersburg, "A new or improved ventilating, disinfecting, and deodorizing cover for water-closets, privies, urinals, night commodes, and other like utensils, also generally applicable to the disinfection and deodorization of foetid or noxious gases and emanations." May 6, 1875.

1694.—WHITLEY, J., York, "Improvements in the purification of gas." May 6, 1875.

GRANTS OF PROVISIONAL PROTECTION.

1468.—JENSEN, P., Chancery Lane, London, "Improvements in 'tube-wells.'" A communication. April 22, 1875.

1491.—WILLIS, C., and PEARSON, W., Bradford, "Improvements in double-acting pumps and pumping-engines for feeding steam-boilers, and other purposes." April 23, 1875.

1494.—BUDGE, R., Valparaiso, "A new or improved apparatus for raising water and other liquids." A communication. April 23, 1875.

1495.—BUDGE, R., Valparaiso, "Improvements in heating and condensing liquids, and in apparatus therefor." A communication. April 23, 1875.

1499.—BUCHAN, W. P., Glasgow, "Improvements in ventilating the soil and waste-water pipes and drains of houses, and in the construction and fitting of water traps or apparatus for the said purpose." April 23, 1875.

1506.—MIDDLETON, J., Leeds, "Improvements in sink and other traps." April 23, 1875.

1515.—LAWRENCE, J. E., and PORTER, E. V., Westminster, London, "Improvements in combined engines and centrifugal pumps." April 24, 1875.

NOTICES TO PROCEED.

1165.—Hallsworth, S., and Bailes, R., Leeds, "Improvements in purifying illuminating coal gas, and in the preparation of the means employed therefor." March 31, 1875.

1545.—Abel, C. D., Chancery Lane, London, "An improved apparatus for heating air or other gases." A communication. April 27, 1875.

INVENTIONS PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

1545.—Abel, C. D., Chancery Lane, London, "An improved apparatus for heating air or other gases." A communication. April 27, 1875.

1642.—Lomax, G. H., Massachusetts, U.S.A., "Improvements in lamps." May 3, 1875.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3847.—Morgan, J. W., Cardiff, "Improvements in annealing pots, boxes, stands, and retorts." Nov. 7, 1874.

3879.—Clark, A. M., Chancery Lane, London, "Improvements in the musical instrument known as the pyrophone, together with the applications of the same." A communication. Nov. 11, 1874.

3908.—Valentin, W. G., South Kensington, London, "Improvements in the treatment of spent oxide of iron for the purpose of extracting cyanogen compounds therefrom." Nov. 12, 1874.

286.—Cory, E., Cardiff, "Improvements in motive-power engines, also applicable to pumps or measures for air, gases, or liquids." Jan. 25, 1875.

477.—Schrebler, G., Guben, Prussia, "Improvements in the construction of pistons for rotary engines and pumps, and in parts connected therewith." Feb. 9, 1875.

602.—Williamson, W. B., Bradford, York, "A new or improved system and means of preventing the pollution of rivers, and extracting and carrying away the noxious vapours from sewers so as to prevent deleterious effects therefrom." Feb. 18, 1875.

622.—Speir, R., Greenock, and Mather, J., Gateshead-on-Tyne, "Improvements in the manufacture or production of gas for illuminating or heating purposes, and for actuating gas-engines." Feb. 20, 1875.

761.—Lake, W. R., Southampton Buildings, London, "Improvements in apparatus for regulating the flow of gas, steam, or air." A communication. March 2, 1875.

791.—Lawrence, J. E., and Porter, E. V., Westminster, London, "Improvements in centrifugal pumps." March 3, 1875.

795.—Robinson, R. C., Preston, Lancs, "Improvements in the mode of and apparatus for manufacturing socketted pipes from clay or other plastic material." March 4, 1875.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

926.—Henderson, A. C., "Improvements in the distillation and filtration of fœcal, solid, and liquid matters direct from privies, for the manufacture of sulphate of ammonia, together with the apparatus therefor; the said process being equally applicable to the distillation and filtration of liquids of all kinds." March 27, 1872.

944.—Campbell, D., "An improved process for the treatment of sewage, and the production of manures therefrom." March 30, 1872.

955.—Symington, W. W., "Apparatus for measuring the flow of sewage and regulating the flow of liquid mixtures used in the purification and deodorization of such sewage, which apparatus is also applicable to other similar purposes." March 30, 1872.

963.—Manent, J. J. F., "Improvements in pumps." April 2, 1872.

983.—Rigod, J. F. M., "An improved apparatus for carburetting air." April 3, 1872.

989.—Sellars, J. C., "Improvements in obtaining hydrocarbon liquids, gas for illuminating and heating purposes, and coke." April 4, 1872.

994.—Lafrogne, J. F., "Improvements in the manufacture of gas for lighting and heating, and in apparatus employed therein." April 4, 1872.

1005.—Wright, W., "Improvements in valves and apparatus for flushing water-closets and other purposes." April 5, 1872.

1022.—Smith, J. W., "An improvement in the ventilation of sewers and drains." April 6, 1872.

1032.—Clark, A. M., "Improvements in the manufacture of illuminating gas and in apparatus for the same." A communication. April 6, 1872.

1038.—Mills, J. H., "Improvements in apparatus for generating heat by the combustion of gas." April 8, 1872.

1050.—Bennett, S., "Improvements in construction and fixing of cocks or valves for high or low pressure." April 9, 1872.

1095.—Kyle, D. D., "Improvements in traps for preventing the escape of foul air and gases." April 12, 1872.

1166.—Rosier, P., "Improvements in apparatus for emptying or exhausting the conduit or supply pipes of cisterns and similar structures as a protection from frost or other damage." April 19, 1872.

1210.—Clark, A. M., "An improved motive-power engine, applicable also as a pump." A communication. April 23, 1872.

1235.—Holmes, W. C., and Hollinshead, W., "Improvements in the process of manufacturing gas, and in the apparatus employed therein." April 25, 1872.

1309.—Box, W. W., "Improvements in apparatus used in the manufacture of gas." May 1, 1872.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

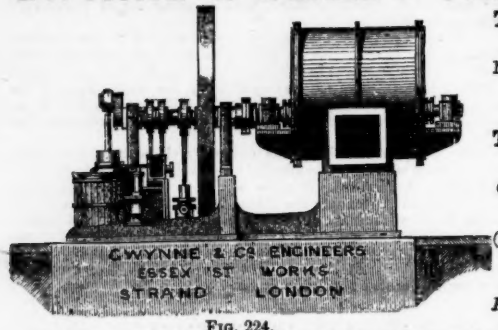


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

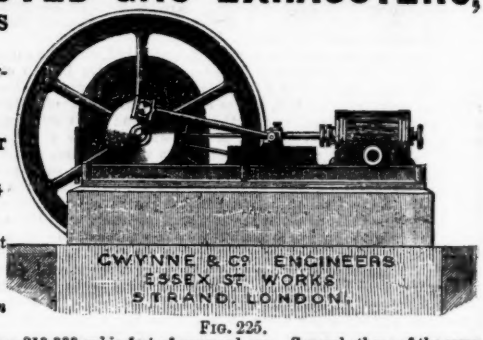


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

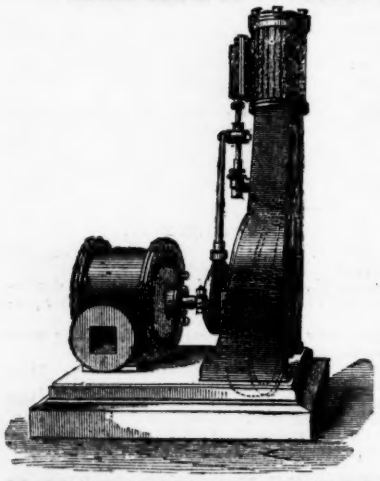
REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER



WITH

ENGINE COMBINED

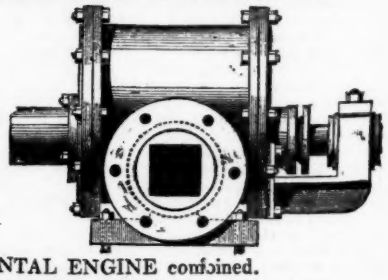
ON

ONE BASE PLATE.

SOLE MAKERS,

GEORGE WALLER & CO.,

Who, since Mr. BEALE'S retirement, are the Oldest Makers.



EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

WANTED, at the Gas-Works, Erith, two steady sober Men as STOKERS.
State wages required, with testimonials or references, to the MANAGER, at the WORKS.

TO GAS MANAGERS.

WANTED, by the Directors of the Berwick and Tweedmouth Gaslight Company, a thoroughly competent and practical MANAGER for their works, situated at Spittal. He will be required to devote his entire time to the interests of the Company. Salary £120 per annum, with free house, coal, and gas.
Applications, with testimonials, are requested to be lodged with the undersigned on or before the 24th inst.
J. WIGHT, Secretary.
Berwick-on-Tweed, May 6, 1875.

WANTED, for the Clones Gas-Works, Ireland, a Man to fill the office of MANAGER and Collector. Salary at the rate of £80 per annum, with dwelling-house, garden, fuel, and light. Must be a practical gas-fitter, and give security in £200 for the faithful discharge of his duties.
Applications to be sent to me, with testimonials, up to the 25th inst., when the Board of Directors will take same into consideration.
By order,
ROBERT REYNOLDS, Secretary.
Dated, Gas-Works, Clones, May 8, 1875.

UCKFIELD GAS COMPANY.

WANTED, an experienced Man to undertake the entire CHARGE of a small Gas-Work, using eight retorts. Must be competent to take meters, lay services, and to keep simple accounts.
Applications, enclosing testimonials as to character and competency, and stating salary required, to be sent in to the undersigned immediately.
J. G. LANGHAM, Jun., Secretary.
Uckfield, May 8, 1875.

WIDNES GAS AND WATER WORKS.

A Thoroughly qualified Assistant is required at once for the Engineer's Office at these works. He should have good experience in the preparation of plans and estimates requisite for large extensions of both Gas and Water Works, levelling, surveying, &c.
Applications, endorsed ASSISTANT, to be addressed to the above Office, with full particulars of past and present occupation, salary, age, and furnish references.

NEW EDITION, NOW READY,
ADVANTAGES OF GAS FOR
COOKING AND HEATING.
By MAGNUS OHREN, A.I.C.E., F.C.S.
For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works, Lower Sydenham, London, S.E.

FOR SALE, cheap, seven cast-iron RETORTS, 14 in. diameter 8 ft. 6 in. long, with socket at back end; also 14 three and two light Dry Meters.
Apply to GERALD J. TUPP, 8, John Street, Adelphi, LONDON, W.C.

FOR SALE—42 oval Retort Mouthpieces, 21 in. by 13½ in., and 32 round ditto, with wrought lids, or any portion of them. Disposed of on account of size. Are in good condition.
For price, &c., apply to F. W. OLDFIELD, Manager, Sutton Southcoates and Drypool Gas Company, HULL.

TO GAS MANAGERS.

FOR SALE, at the Louth Gas-Works, a small Vertical STEAM-ENGINE, 4-horse power, an 8-in. Governor, and a Steam-Pump. All second-hand.
For price and further particulars apply to Mr. ARNOTT, Gas Engineer, Leeds; or Mr. T. F. ALLISON, Clerk to the Gas Company, Louth, LINCOLNSHIRE.

ON SALE—A Station-Meter, 4 ft. by 4 ft., with 6-in. connexions, valves, and bye-pass. Only been erected five years. Can be seen at work. The only reason for being removed is to be replaced by a large one.
Apply, to H. AND F. BAILEY, Gas Engineers, &c., EAST RETFORD.

ON SALE (on account of replacement by larger), one set of four 10-ft. PURIFIERS, with lifting gear, dry centre-valve, 10-inch connexions. The whole of the apparatus is Thorncliffe manufacture, and in capital condition.
Apply to Mr. LONGWORTH, Dukinfield, MANCHESTER.

WATER-METER FOR SALE.

TO BE DISPOSED OF, the Water-Meter that has been used for supplying the district of Newland, made by Kennedy's Patent Meter Company. Capable of supplying a manufactory or township. Present owners have no further use for it.
Apply to GEORGE WADDINGTON, Newland, near HULL.

ON SALE, at the Doncaster Corporation Gas-Works, a STATION-METER complete, with clock, bye-pass, and hydraulic valves. Also a Governor, with two 10-in. slide-valves. These apparatus are to be sold solely in consequence of being too small for present and future use in their present situations.
The Station-Meter is in good repair, was made by West and Gregson, and has worked most satisfactorily to the present time, passing occasionally 12,000 cubic feet per hour.
The Governor is in good repair, and has worked quite satisfactorily to the present time, regulating the supply of gas for a consumption of 250,000 cubic feet per day of 24 hours.
Tenders for the Station-Meter and Governor, either together or separate, to be addressed to Mr. Alderman Dunhill, Chairman of the Gas Committee, on or before the 10th day of June next, endorsed "Tender for Station-Meter," or "Tender for Governor."
The undersigned will give any information as to the quality of the two instruments.—By order,
SAMUEL DARWIN, Engineer and Manager.
May 7, 1875.
The Committee do not bind themselves to accept the highest or any tender.

FOR SALE—A circular cast-iron Tank, 36 ft. in diameter and 12 ft. deep.
For particulars apply to the GAS COMPANY, LEICESTER.

RHOS GAS COMPANY, LIMITED.

FOR SALE—A complete Gas Apparatus, in good working order. Capable of making from 7000 to 8000 cubic feet in 24 hours. Suitable for a village or large works.
For further particulars, and order to view, apply to the undersigned, to whom tenders must be sent, on or before Monday, the 31st of May.
GEO. E. WOODFORD, Secretary.
Rhos, near Ruabon, North Wales, April 23, 1875.

BOG IRON ORE.

PROPOSALS will be received for Bog IRON ORE, f.o.b. in a port in Donegal, in quantities as may be agreed on.
Address, A. B. C., Ramelton, Letterkenny, IRELAND.

THE Directors of the Epsom and Ewell Gas Company require a MANAGER for their works. He must possess a thorough practical knowledge of the manufacture and distribution of gas, and will have to take meters and collect accounts.
Applications, with copies of testimonials, and statement of salary required, to be addressed to the care of the SECRETARY, EPSOM.

WOLSTON'S TORBAY IRON PAINTS.

THE Torbay and Dart Paint Company, Limited, 23, Great George Street, Westminster, S.W., having been informed that PAINTS not manufactured by them are being offered to Gas Companies and the public as "WOLSTON'S," hereby give notice that they will TAKE PROCEEDINGS against any persons infringing their rights as sole proprietors and manufacturers of Wolston's Torbay Iron Paints.
(See Advertisement on another page.)

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Bury Im- provement Commissioners are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their works, for One, Two, or Three years.
Further particulars may be obtained on application to the undersigned.
Tenders, endorsed "Tenders for Tar and Ammoniacal Liquor," addressed to the Clerk of the Bury Improvement Commissioners, to be sent in not later than Saturday, the 15th day of May.
JOSEPH WOOD, Engineer and Manager.
Gas-Works, Bury, Lancashire, April 22, 1875.

TO CONTRACTORS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the excavation and construction of a GASHOLDER-TANK, 156 feet in diameter, at their Neepsend Works.
The Tank is to be built of Portland cement concrete.
Plans and specifications to be seen at the Company's Offices, Commercial Street.
Tenders to be endorsed "Tender for Tank," and addressed to the undersigned, and sent in on or before Tuesday, the 25th day of May, 1875.
The Directors do not bind themselves to accept the lowest or any tender.
THOS. ROBERTS, Manager.

TO GASHOLDER MAKERS.

THE Devizes Gas Committee are open to receive TENDERS for the making and erection of a new GASHOLDER.
The dimensions are to be 70 feet diameter and 26 feet in height, with necessary columns and girders. The Holder to be made of the best Staffordshire iron.
Tenders and estimates, to be accompanied by drawings and specifications of the form, size, and weight of materials required, to be sent to the Chairman of the Committee without delay.
The Committee do not bind themselves to accept the lowest or any tender.
The inlet and outlet pipes to be 12 inches diameter.

AMMONIACAL LIQUOR.

THE Directors of the London Gaslight Company are prepared to receive TENDERS for the whole of the AMMONIACAL LIQUOR produced at the Company's Works, Nine Elms, during three years from the 30th of June next. The quantity produced at the present time is about 23,000 butts, of 8 to 10 ozs. strength, per annum.
Further particulars and conditions of contract may be had on application.
Tenders to be sent in by the 1st prox.
A. J. DOVE, Secretary.
26, Southampton Street, Strand, W.C.,
May 10, 1875.

TO IRONFOUNDERS AND GASHOLDER MAKERS

THE Widnes Local Board invite Tenders for the supply and erection of a Telescopic GASHOLDER, with columns, &c., 104 ft. diameter, for their new gas station at Ditton.
Plans and specification may now be seen at the Engineer's Office, Gas and Water Works, Widnes.
Tenders, endorsed "Tender for Gasholder," to be addressed to the Chairman of the Gas and Water Committee, and delivered at the above Offices, not later than the 20th inst.
The Board do not bind themselves to accept the lowest or any tender.
HENRY ROBERTS.
Public Offices, Widnes, May 4, 1875.

GAS COMPANIES AUDITS AND ACCOUNTS.
SPECIAL DEPARTMENT.

MESSRS. BROWNE, STANLEY, & CO., Beg to inform their Clients and Friends that they have added this speciality to their general business of Public Accountants and Auditors.
The department will be under the management of Mr. W. Monro Platt, who for 13 years held the appointment of Secretary and Accountant to the West London Junction Gaslight Company, Limited.
Terms on application at Messrs. BROWNE, STANLEY, AND CO.'s Offices, 25, Old Jewry, LONDON.

TENDERS.

THE Local Board for the district of Hindley invite TENDERS for the following surplu GAS FIXTURES, viz.:—
Twenty-four 13-in. by 14-in. Mouthpieces.
Twenty-four 4-in. H-Pipes.
Twenty-four 4-in. Ascension-Pipes.
Six Furnace Doors.
Forty-eight feet of 16-in. cast-iron Hydraulic Main.
One 8-in. Exhauster, with engine combined, by Dempster, of Elland.
Tenders to be sent, addressed to the Chairman of the Board, and endorsed "Tender for Surplus Gas Fixtures," on or before the 22nd of May next.
The Board do not bind themselves to accept the highest or any tender.
By order,
STEPHEN HOLT, Clerk to the Board,
Offices, Cross Street, Hindley, May 4, 1875.

TO COAL PROPRIETORS AND OTHERS.

THE Gas Committee of the Bury Im- provement Commissioners are prepared to receive TENDERS for the supply of 8000 tons of COAL, and 5000 tons of CANNEL, to be delivered at the Railway Station, Bury, in equal monthly quantities during the year ending March 31, 1876.
Further particulars can be obtained on application to the undersigned.
Tenders, endorsed "Tenders for Cannel and Coal," addressed to the Clerk of the Bury Improvement Commissioners, to be sent in not later than Saturday, the 15th day of May.
JOSEPH WOOD, Engineer and Manager.
Gas-Works, Bury, Lancashire, April 22, 1875.

HAMPTON COURT GAS COMPANY.

TENDERS FOR GAS COALS.

THE Directors of the above Company are prepared to receive TENDERS for the supply of about 3000 tons of Best Inland COALS, to be delivered on the Company's siding, at their Works at Teddington, in such quantities and at such times as may be directed by the Company's Engineer and Manager, from whom further information may be obtained.
Tenders to be addressed, under seal, to F. J. Kent, Esq., Castle House, Hampton, Chairman of the Company, on or before the 18th inst.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
W. HAMMOND, Secretary.

TO COAL MERCHANTS, SHIPOWNERS, & OTHERS.

THE Directors of the Torquay Gas Com- pany are prepared to receive TENDERS for the supply of about 5000 tons (or such other quantity as may be agreed on) of Pelaw Main, Waldridge, New Pelton, Peareth, or other approved GAS COAL. About 600 tons per month to be delivered during June, July, August, September, and October, and the remainder at the rate of about 400 tons per month during the succeeding five months.
The Company to have the option from time to time of taking either of the Coals specified in the contract, and also of having the same delivered at Torquay, Paignton, or Dartmouth.
Tenders to state the price of the Coals and freight separately and together, and also of delivery into the Gas-Works free of all charges.
Payment by cash for freight on delivery, and by three months bills for the Coals.
Further particulars to be obtained from Mr. Greenfield, the Manager of the Company, Hollacombe, Paignton, and tenders to be sent to the undersigned, on or before the 17th day of May inst.
By order,
J. KITSON, Secretary.
Torquay, May 3, 1875.

SOCIETY FOR THE PROMOTION OF
SCIENTIFIC INDUSTRY.
THE EXHIBITION OF APPLIANCES FOR THE ECONOMY OF LABOUR,
CHEETHAM HILL ROAD, MANCHESTER,
WILL BE OPENED on FRIDAY, MAY 14, by the EARL OF DERBY, D.C.L., F.R.S.
JOHN ANDERSON, Esq., C.E., LL.D., late Superintendent of Machinery to the War Department, will deliver the Address.
Admission—Opening Day, 5s.; Ordinary Days, 1s.; Season Tickets, 10s. 6d.—By order,
WILLIAM GEORGE LARKINS, Secretary.
9, Mount Street, Albert Square.

ECONOMY OF LABOUR.—The Exhibi- TION OF APPLIANCES for the Working of METALS, WOOD, AND STONE, And for Domestic Purposes, WILL OPEN MAY 14.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.
JACKSON, FOX, AND ELLEN,
35, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 37 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.
HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, LONDON, E.C.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE- DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.
Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

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60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

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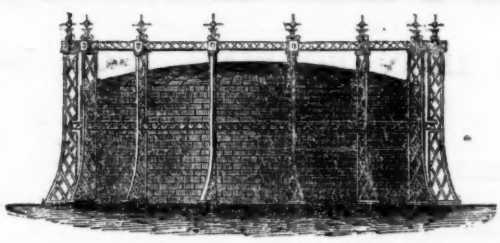

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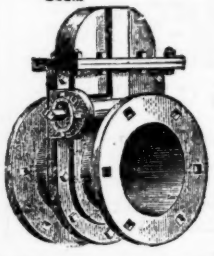

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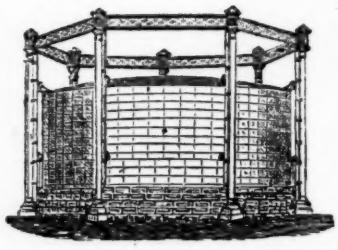

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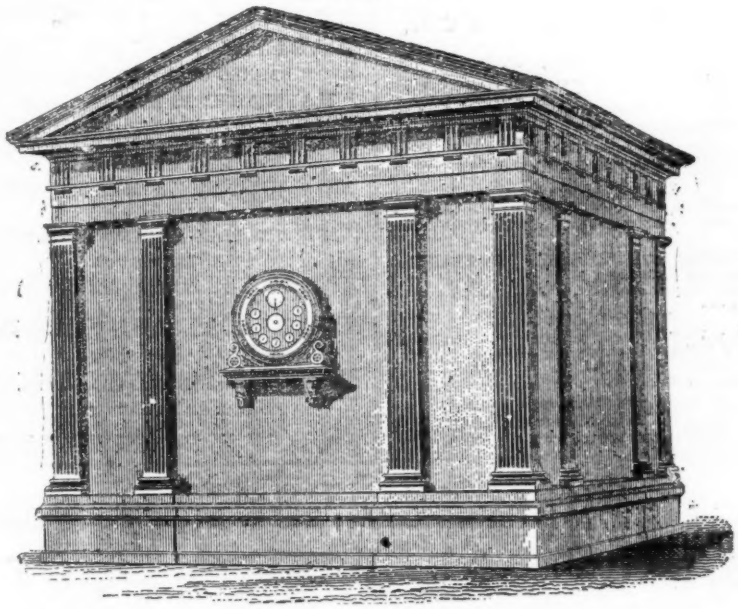

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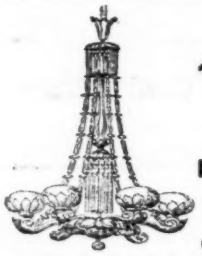

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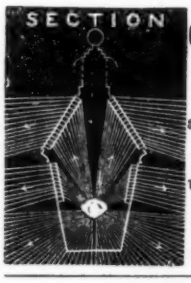

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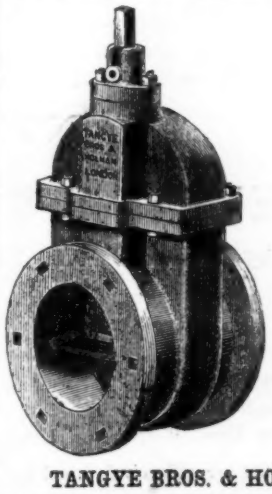

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Which yields 10,575 cubic feet of 27·38 standard candle gas; and 1240 pounds of coke, containing 11·56 per cent. of ash; and

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Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

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Purified gas per ton of coal in cubic feet (average)	**10,775**
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1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.		Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure	13,095 cubic feet.	..	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	..	34·83
Value of 1 cubic foot of gas in grains of sperm	780	..	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	..	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	..	71 minutes.
Gravity of the gas (air = 1000)	596	..	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.		Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	..	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	..	33·09
Value of 1 cubic foot of gas in grains of sperm	878	..	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	..	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	..	67 minutes.
Gravity of the gas (air = 1000)	677	..	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

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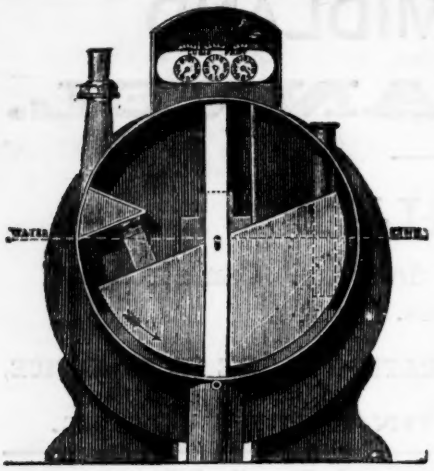

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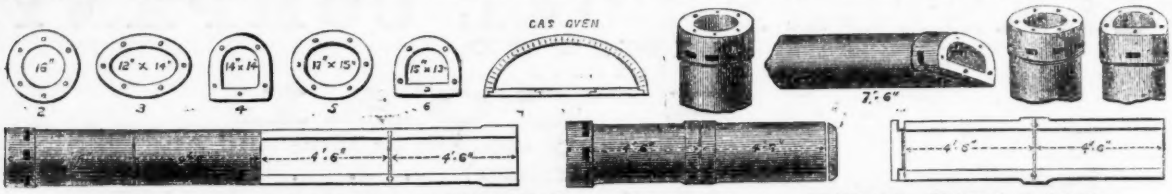

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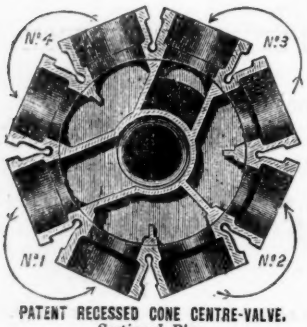

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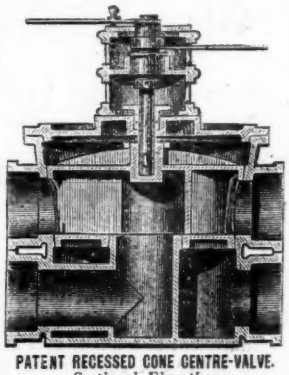

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